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United States Patent [19]

Fado et al.

[11] Patent Number: 5,995,933

[45] Date of Patent: Nov. 30, 1999

[54] **CONFIGURING AN AUDIO INTERFACE CONTINGENT ON SOUND CARD COMPATIBILITY**

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[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.

[21] Appl. No.: **08/960,155**

[22] Filed: **Oct. 29, 1997**

[51] **Int. Cl.**[6] **G06F 3/16**; G10L 3/00

[52] **U.S. Cl.** **704/270**; 345/978; 395/681; 704/275

[58] **Field of Search** 704/270, 275, 704/276, 278; 345/978; 395/681, 284, 892, 682

[56] **References Cited**

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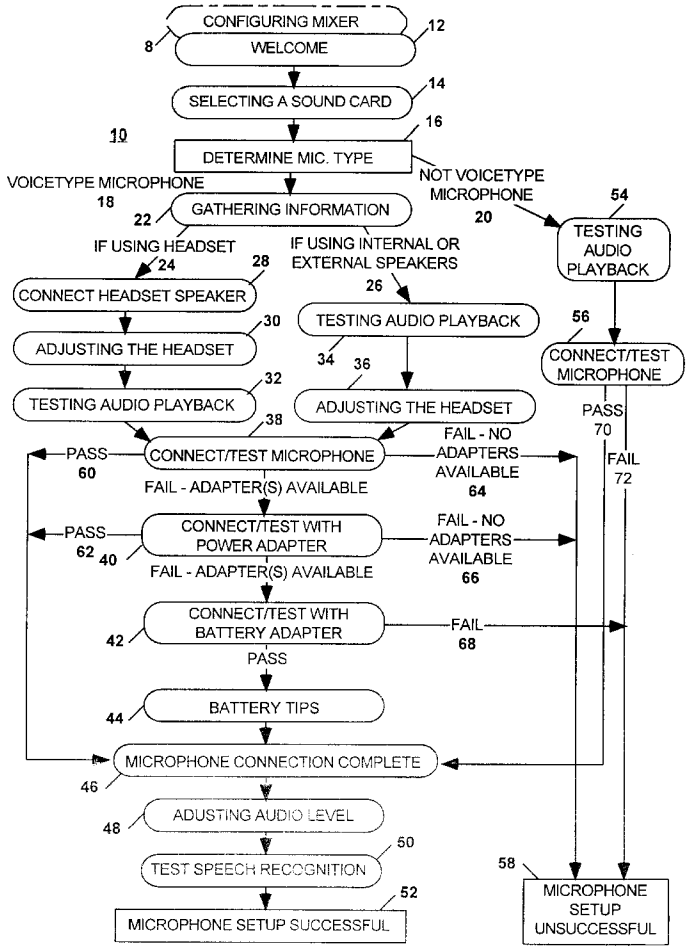
5,630,175	5/1997	Gajewski et al.	395/892
5,715,369	2/1998	Spoltman et al.	395/2.79
5,822,718	10/1998	Bakis et al.	702/180

Primary Examiner—David R. Hudspeth
Assistant Examiner—Martin Lerner
Attorney, Agent, or Firm—Quarles & Brady LLP

[57] **ABSTRACT**

A method for configuring an audio interface for a speech recognition application in a computer system comprises the steps of: (a) determining how many sound cards present in the computer system are capable of supporting speech; (b) in the event at least two of the sound cards present in the computer system are speech capable, displaying a first graphical user interface for user selection of the speech capable sound cards; and, (c) in the event only one speech capable sound card is detected, and in the event one of at least two speech capable sound cards has been user selected, determining if an audio mixer is present in the computer system.

10 Claims, 48 Drawing Sheets



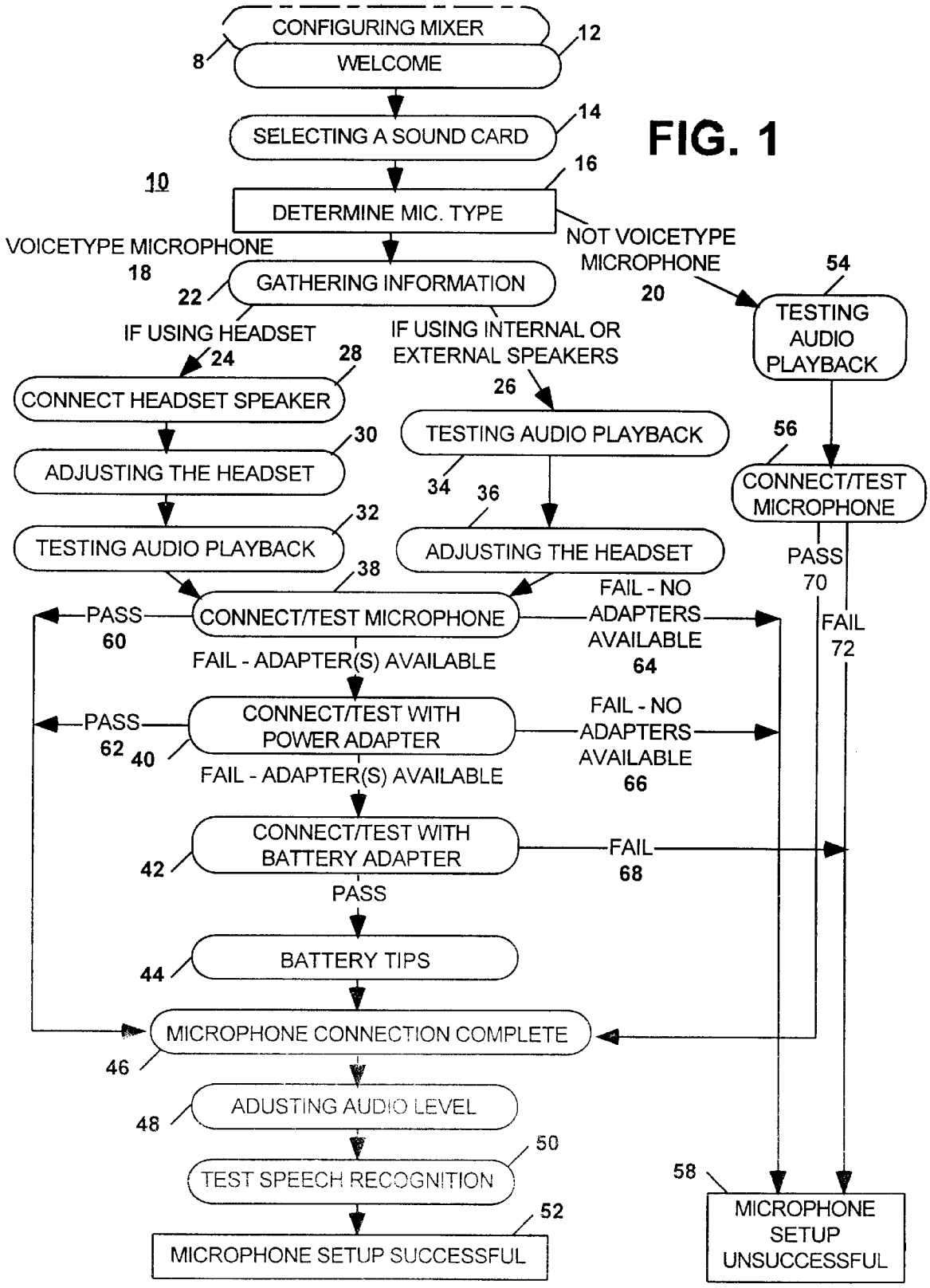

CONFIGURING MIXER
8
WELCOME
12
SELECTING A SOUND CARD
14
10
DETERMINE MIC. TYPE
16
VOICETYPE MICROPHONE
18
NOT VOICETYPE MICROPHONE
20
GATHERING INFORMATION
22
IF USING HEADSET
24
IF USING INTERNAL OR EXTERNAL SPEAKERS
26
CONNECT HEADSET SPEAKER
28
TESTING AUDIO PLAYBACK
ADJUSTING THE HEADSET
30
TESTING AUDIO PLAYBACK
32
34
36
ADJUSTING THE HEADSET
38
CONNECT/TEST MICROPHONE
PASS
60
FAIL - NO ADAPTERS AVAILABLE
64
FAIL - ADAPTER(S) AVAILABLE
CONNECT/TEST WITH POWER ADAPTER
PASS
62
40
FAIL - NO ADAPTERS AVAILABLE
66
FAIL - ADAPTER(S) AVAILABLE
CONNECT/TEST WITH BATTERY ADAPTER
42
FAIL
68
PASS
BATTERY TIPS
44
MICROPHONE CONNECTION COMPLETE
46
ADUSTING AUDIO LEVEL
48
TEST SPEECH RECOGNITION
50
MICROPHONE SETUP SUCCESSFUL
52
54
TESTING AUDIO PLAYBACK
56
CONNECT/TEST MICROPHONE
PASS
70
FAIL
72
58
MICROPHONE SETUP UNSUCCESSFUL

FIG. 1

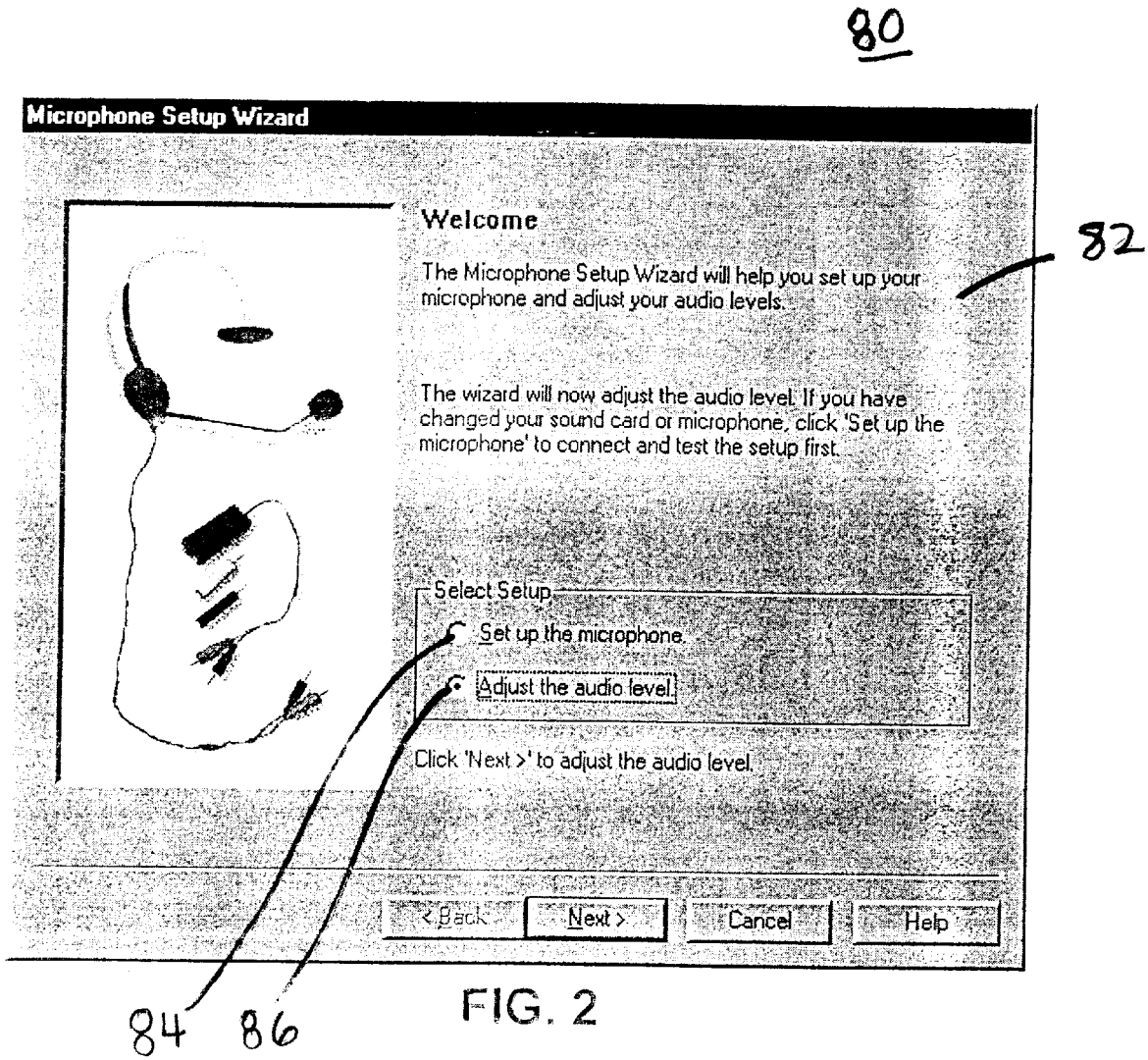

80
Microphone Setup Wizard
Welcome
82
The Microphone Setup Wizard will help you set up your microphone and adjust your audio levels.
The wizard will now adjust the audio level. If you have changed your sound card or microphone, click 'Set up the microphone' to connect and test the setup first.
Select Setup
Set up the microphone.
Adjust the audio level.
Click 'Next >' to adjust the audio level.
< Back
Next >
Cancel
Help
84
86

FIG. 2

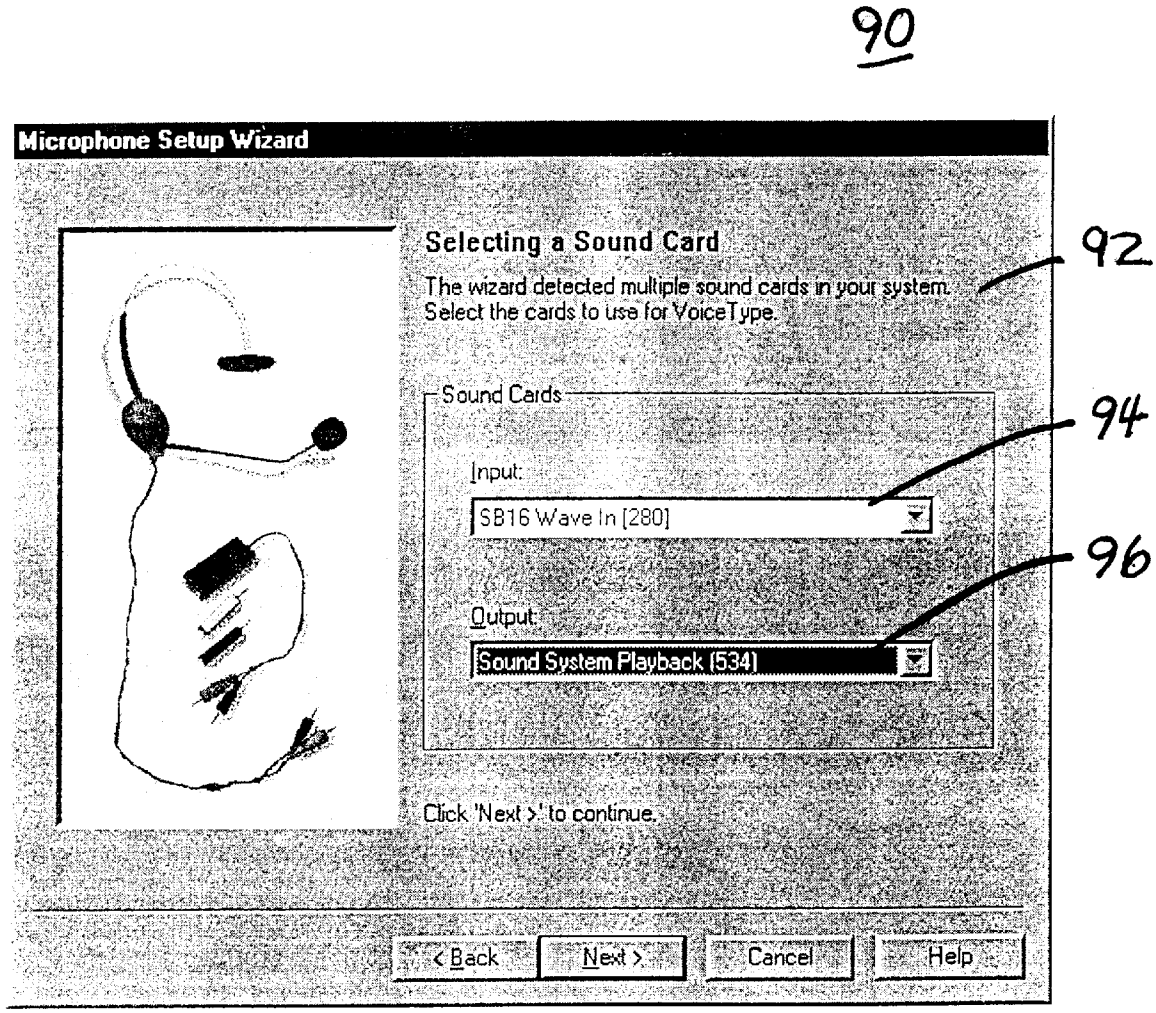

90
Microphone Setup Wizard
Selecting a Sound Card
92
The wizard detected multiple sound cards in your system.
Select the cards to use for VoiceType.
Sound Cards
94
Input:
SB16 Wave In [280]
96
Output:
Sound System Playback [534]
Click 'Next >' to continue.
< Back
Next >
Cancel
Help

FIG. 3

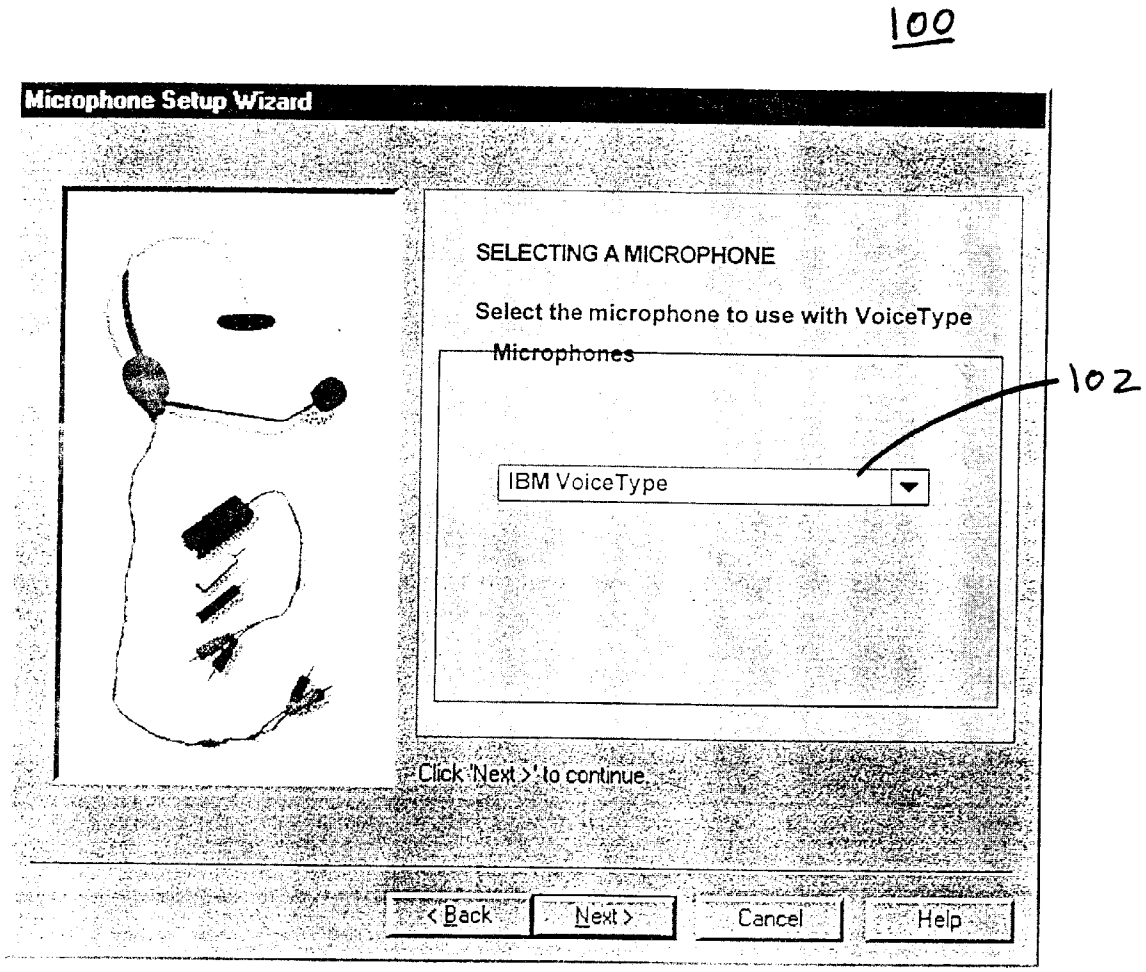

100
Microphone Setup Wizard
SELECTING A MICROPHONE
Select the microphone to use with VoiceType
Microphones
102
IBM VoiceType
Click 'Next >' to continue.
< Back
Next >
Cancel
Help

FIG. 4

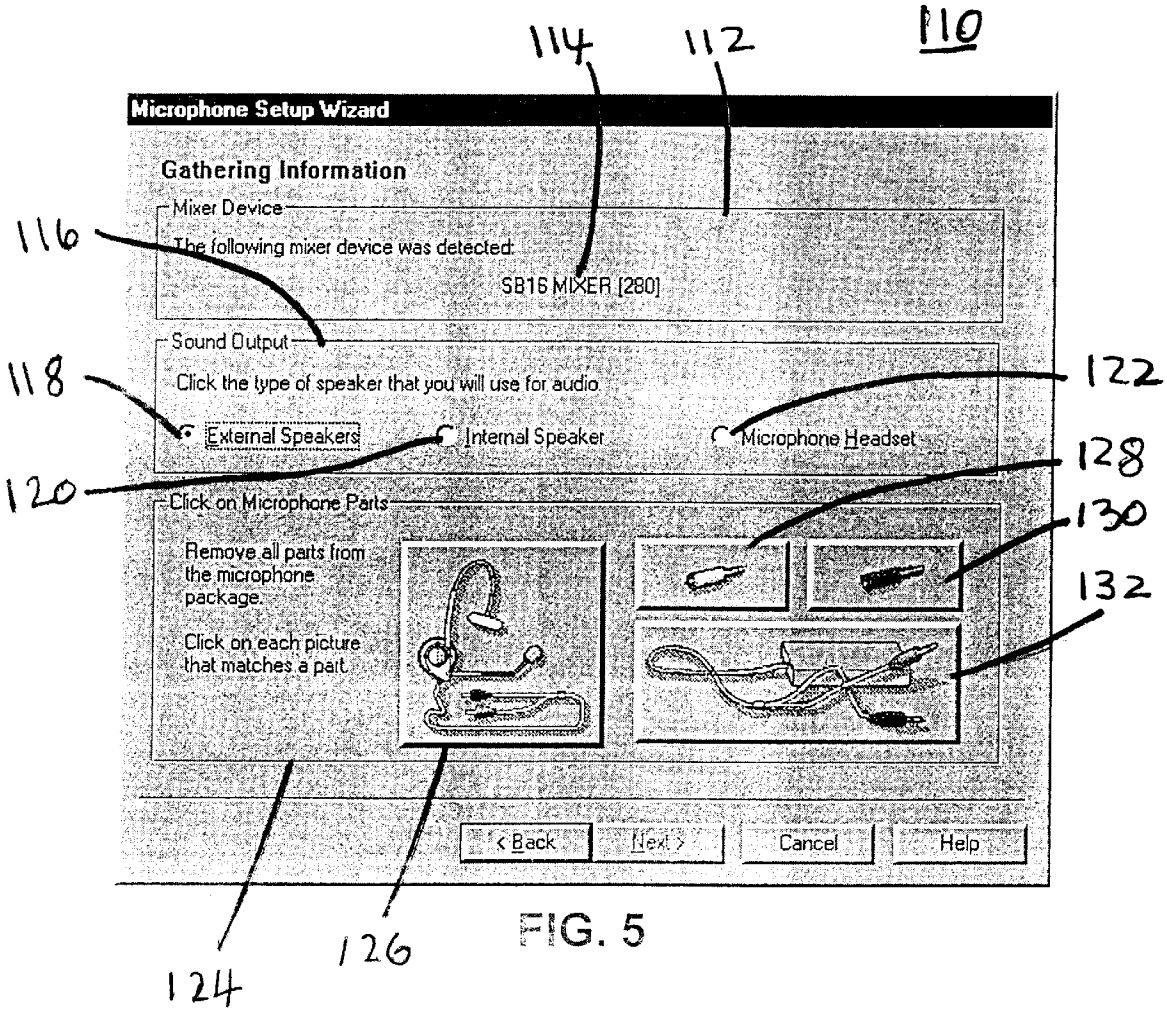

110
114
112
Microphone Setup Wizard
Gathering Information
Mixer Device
The following mixer device was detected:
SB16 MIXER [280]
116
Sound Output
Click the type of speaker that you will use for audio.
118
122
External Speakers
Internal Speaker
Microphone Headset
120
128
Click on Microphone Parts
130
Remove all parts from the microphone package.
132
Click on each picture that matches a part.
< Back
Next >
Cancel
Help
124
126

FIG. 5

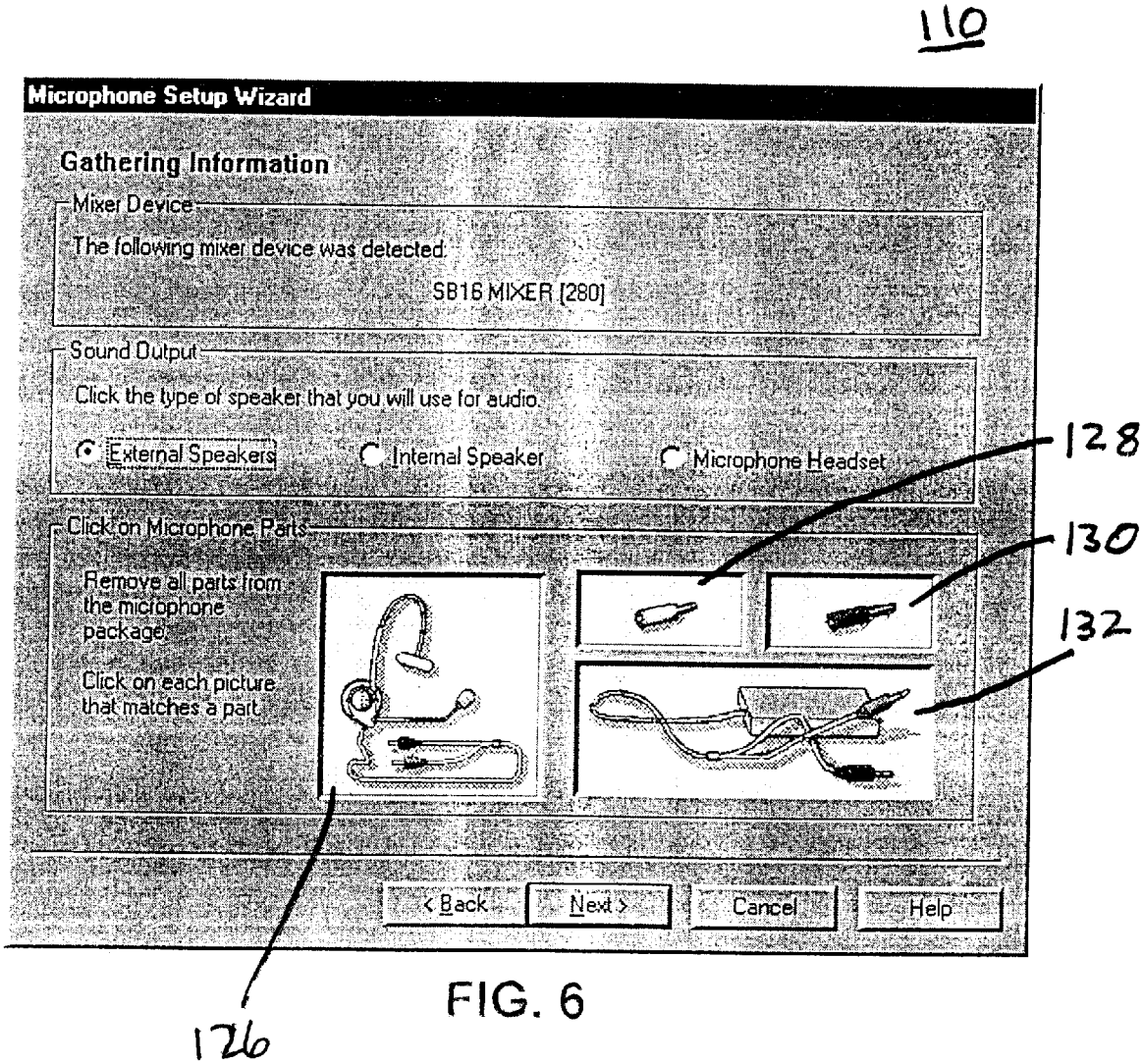

110
Microphone Setup Wizard
Gathering Information
Mixer Device
The following mixer device was detected.
SB16 MIXER [280]
Sound Output
Click the type of speaker that you will use for audio.
External Speakers
Internal Speaker
Microphone Headset
Click on Microphone Parts
Remove all parts from the microphone package.
Click on each picture that matches a part.
128
130
132
126
< Back
Next >
Cancel
Help

FIG. 6

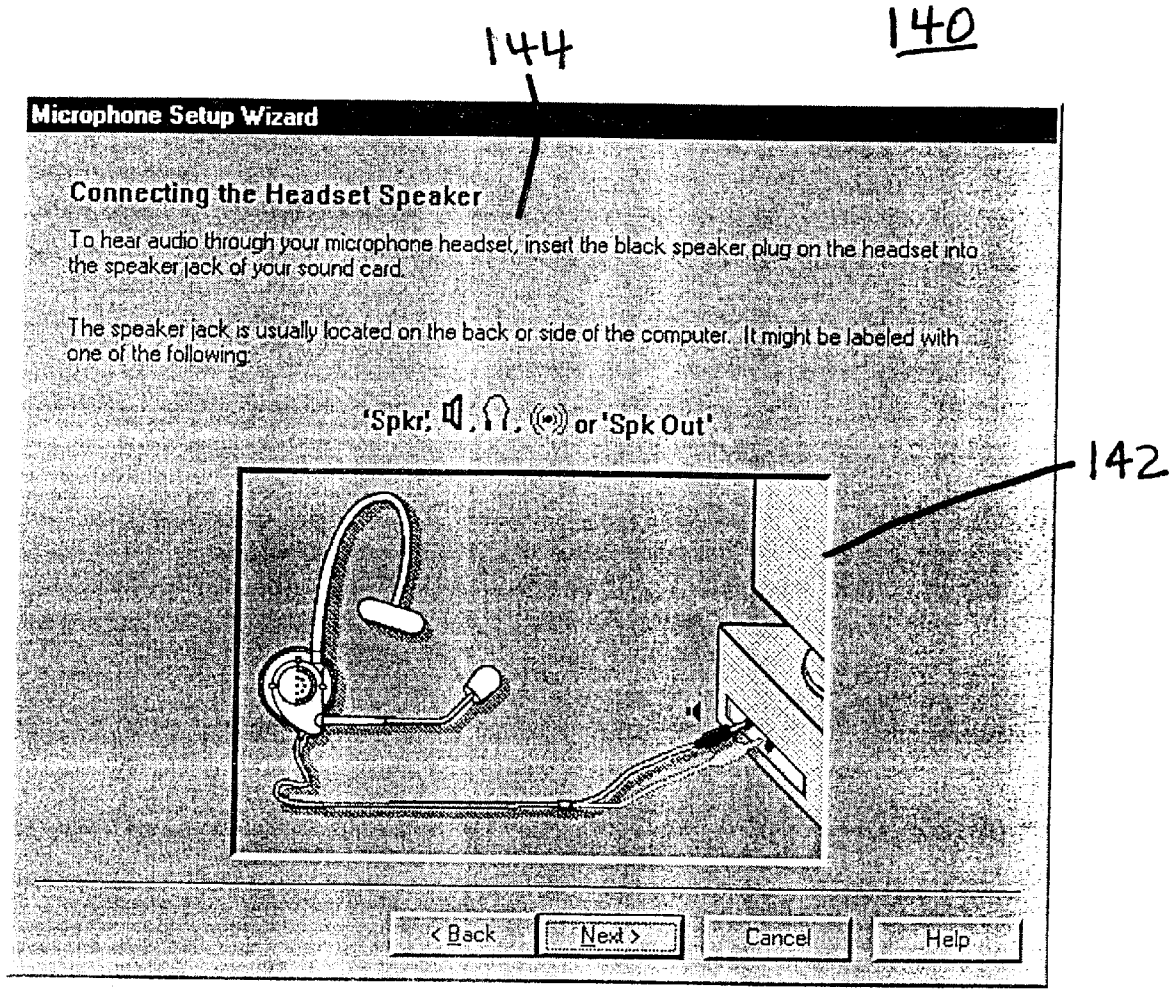

144
140
Microphone Setup Wizard
Connecting the Headset Speaker
To hear audio through your microphone headset, insert the black speaker plug on the headset into the speaker jack of your sound card.
The speaker jack is usually located on the back or side of the computer. It might be labeled with one of the following:
'Spkr', or 'Spk Out'
142
< Back
Next >
Cancel
Help

FIG. 7

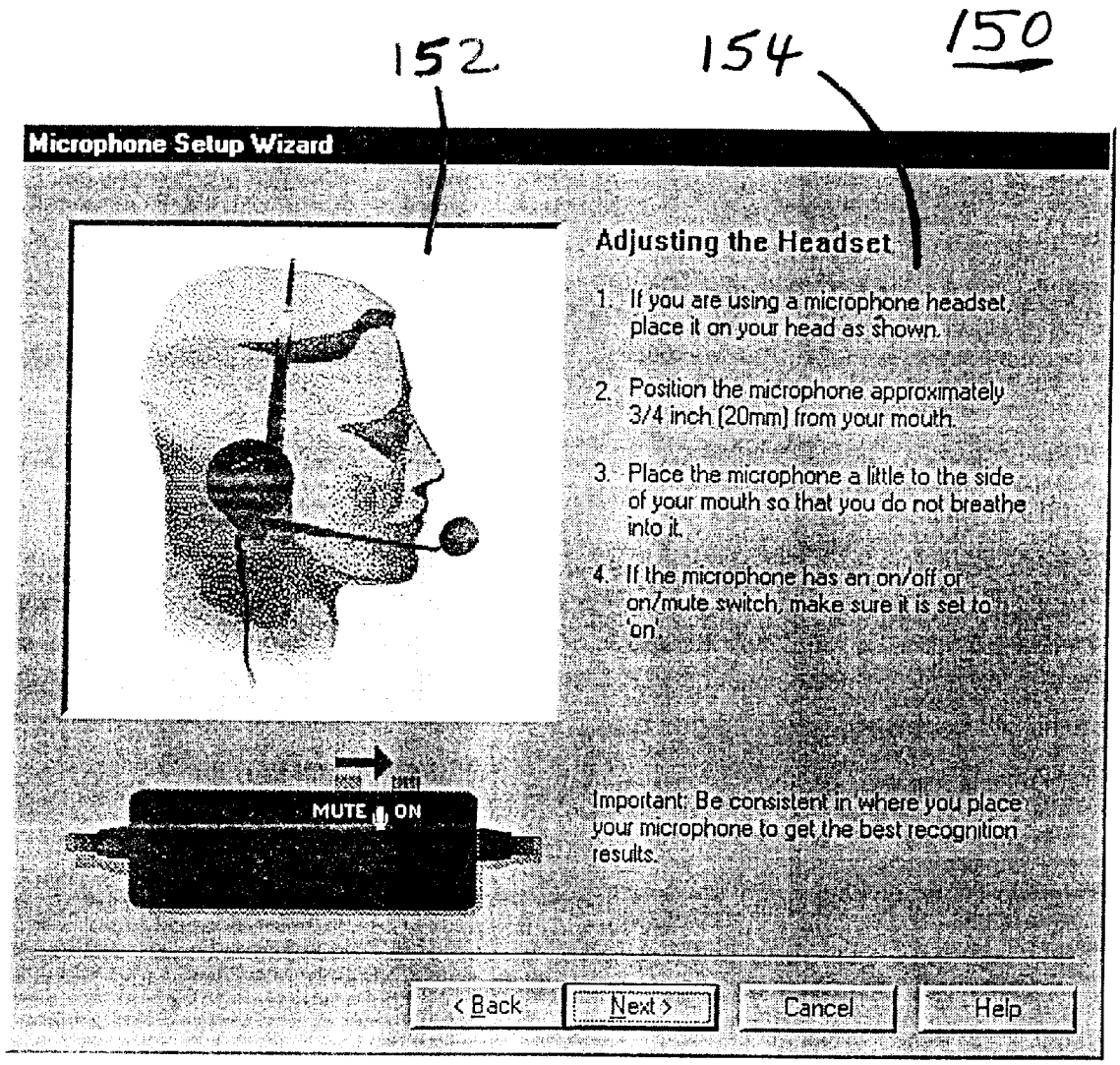

152
154
150
Microphone Setup Wizard
Adjusting the Headset
1. If you are using a microphone headset, place it on your head as shown.
2. Position the microphone approximately 3/4 inch (20mm) from your mouth.
3. Place the microphone a little to the side of your mouth so that you do not breathe into it.
4. If the microphone has an on/off or on/mute switch, make sure it is set to 'on'.
MUTE
ON
Important: Be consistent in where you place your microphone to get the best recognition results.
< Back
Next >
Cancel
Help

FIG. 8

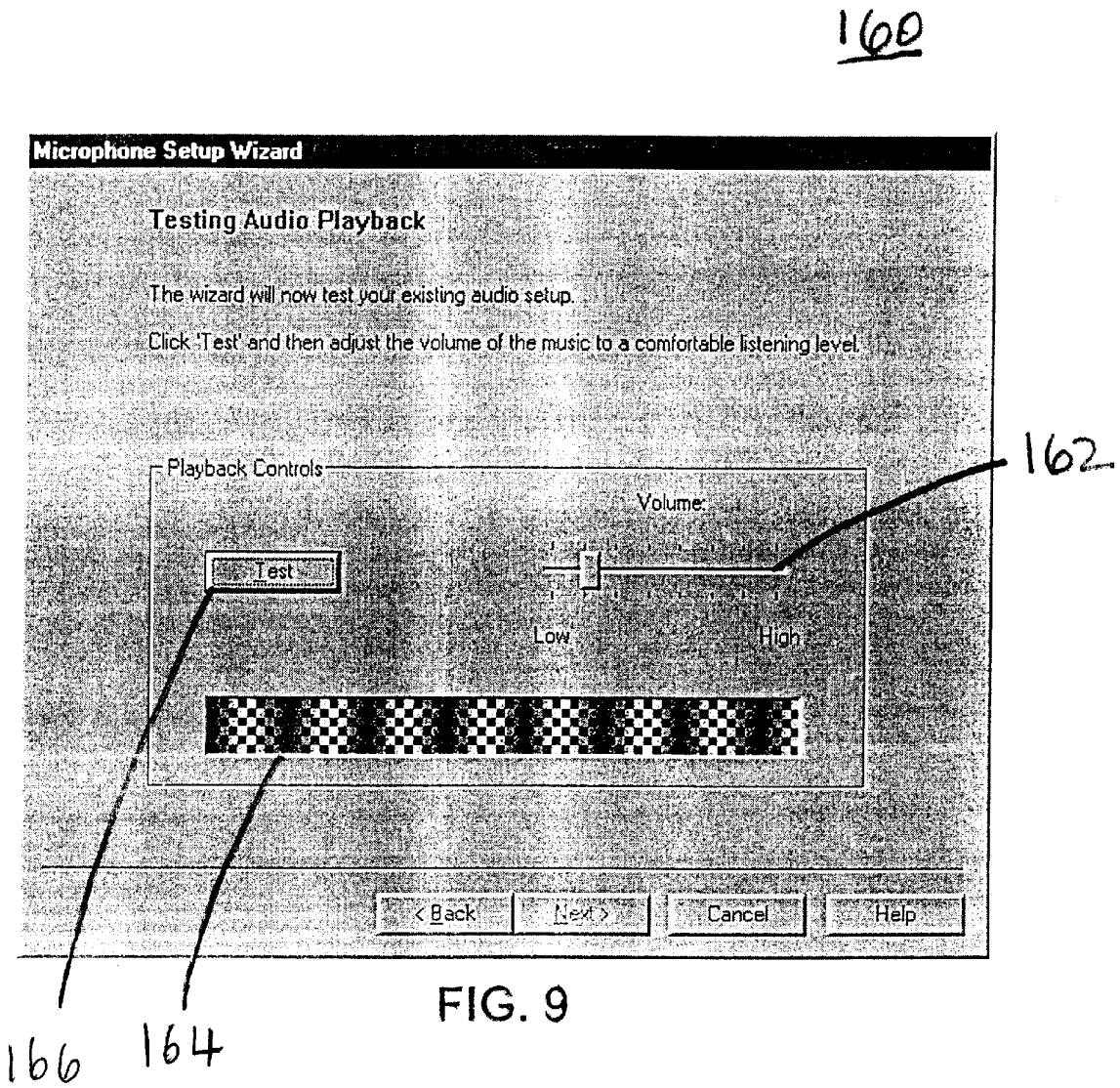

160
Microphone Setup Wizard
Testing Audio Playback
The wizard will now test your existing audio setup.
Click 'Test' and then adjust the volume of the music to a comfortable listening level.
Playback Controls
Volume:
Test
Low
High
< Back
Next >
Cancel
Help
162
166
164

FIG. 9

170

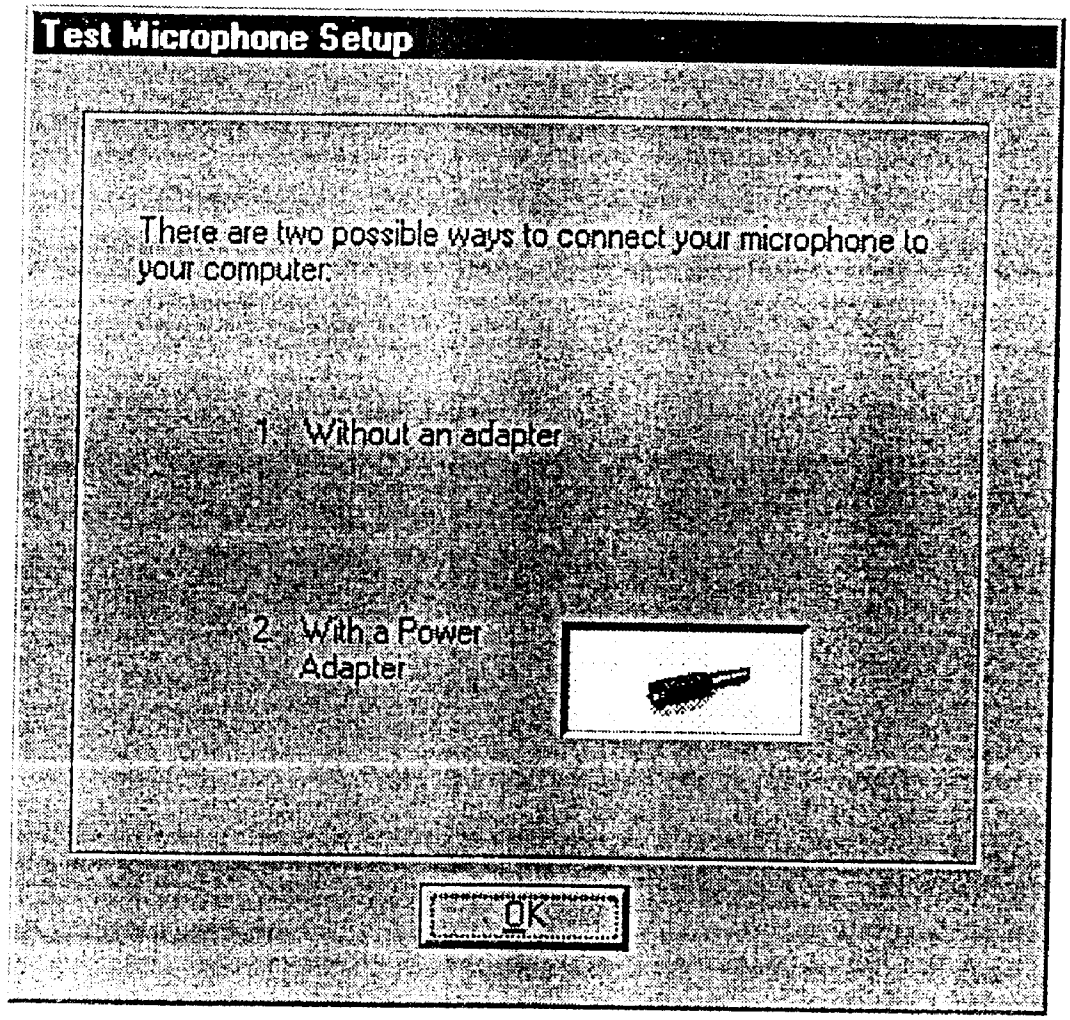

Test Microphone Setup
There are two possible ways to connect your microphone to your computer:
1. Without an adapter
2. With a Power Adapter
OK

FIG. 10

172

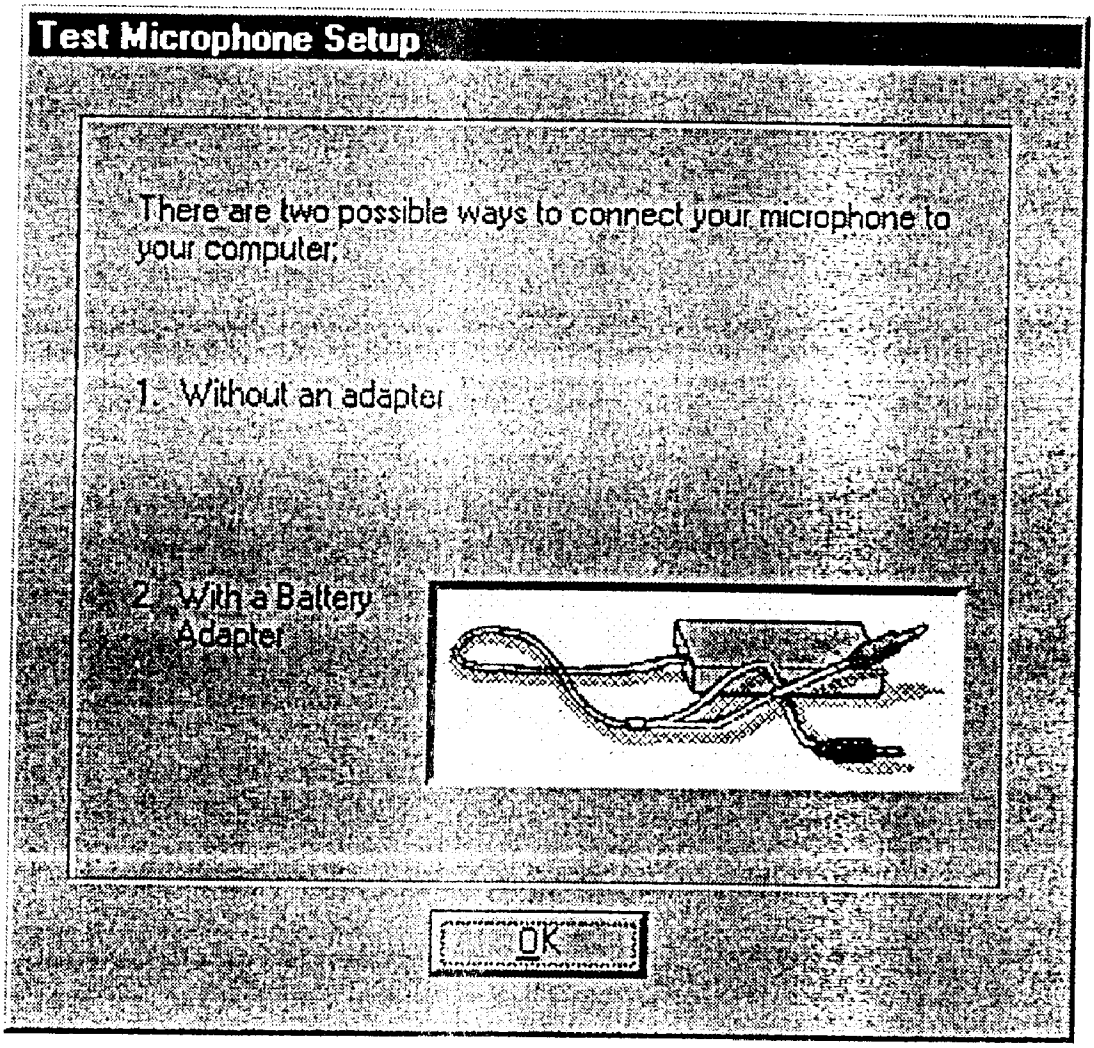

Test Microphone Setup
There are two possible ways to connect your microphone to your computer;
1. Without an adapter
2. With a Battery Adapter
OK

FIG. 11

174

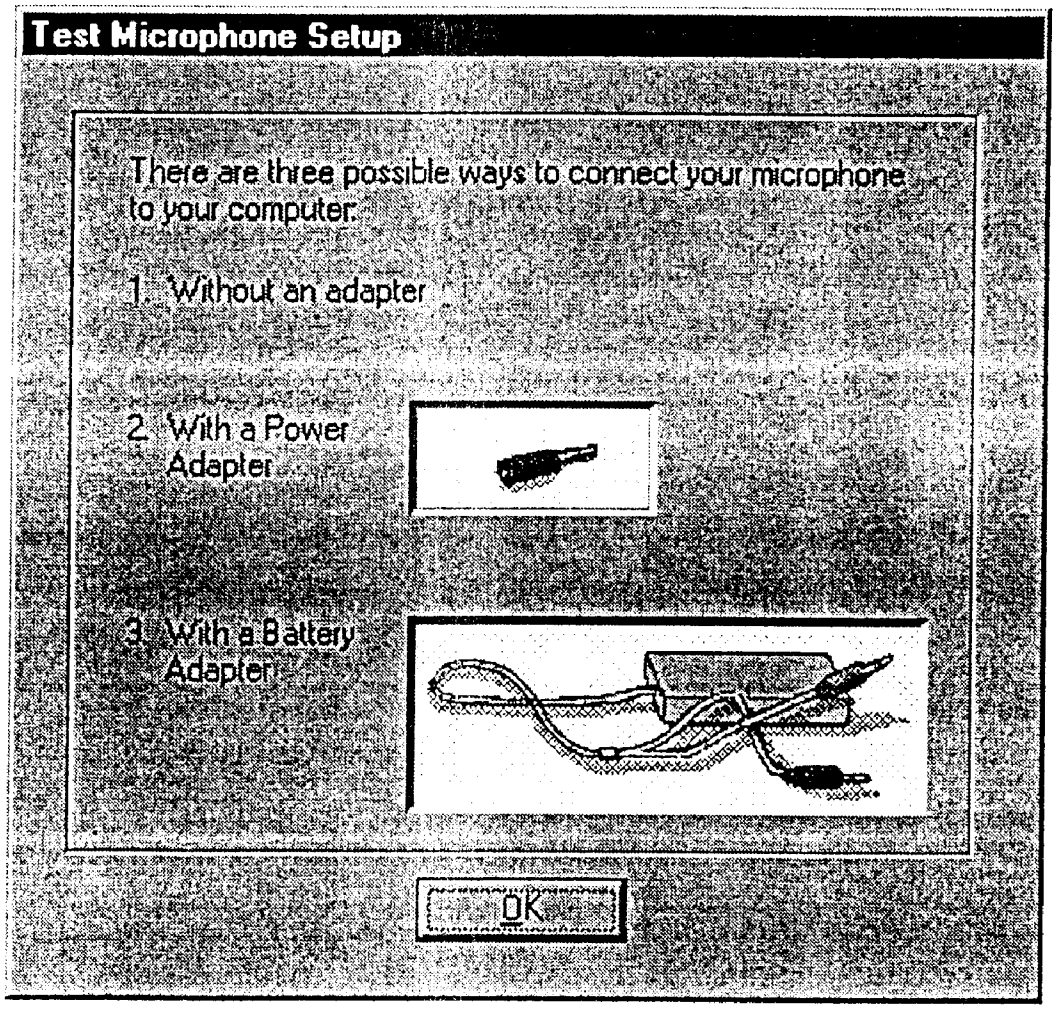

Test Microphone Setup
There are three possible ways to connect your microphone to your computer.
1. Without an adapter
2. With a Power Adapter
3. With a Battery Adapter
OK

FIG. 12

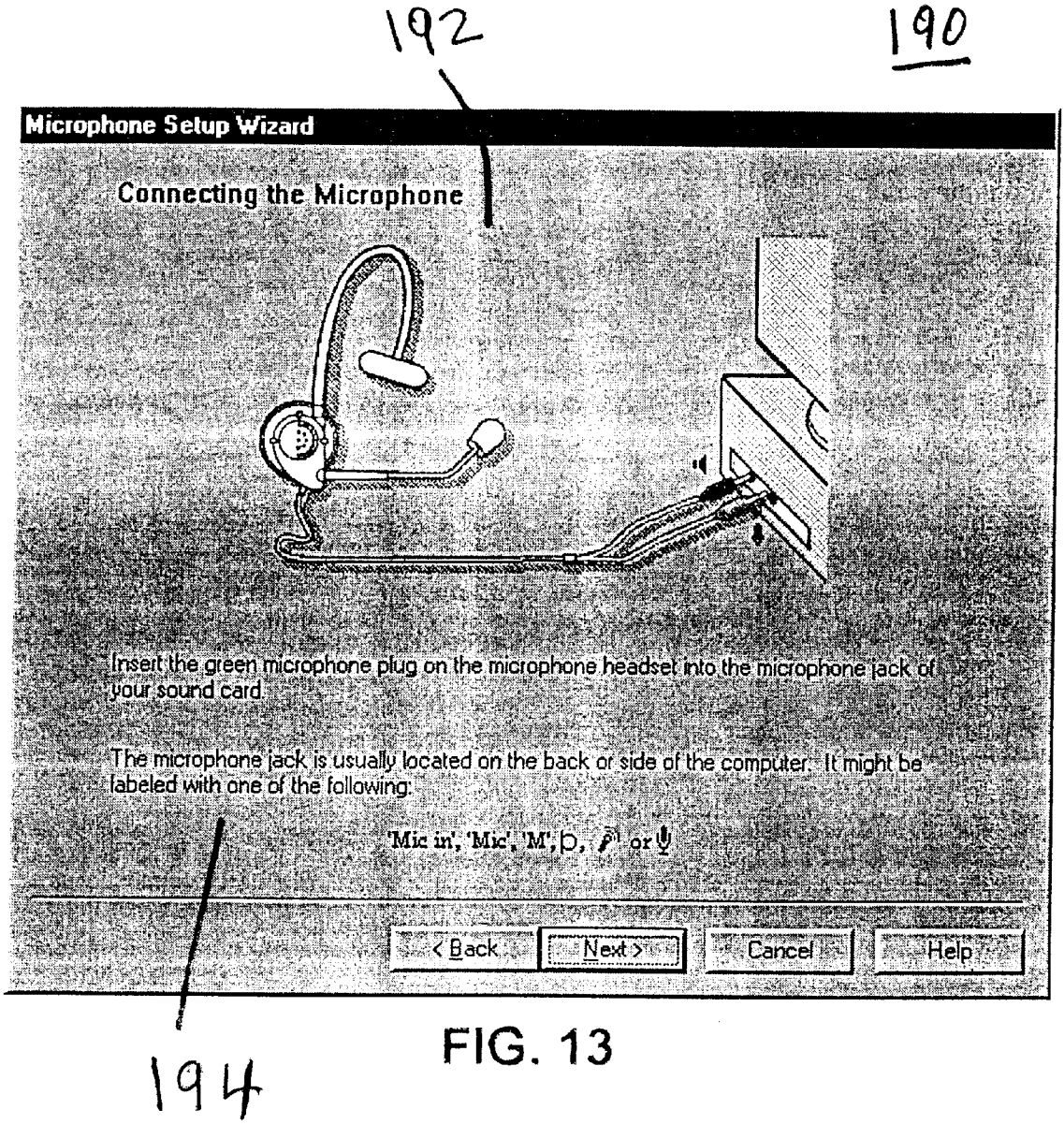

192
190
Microphone Setup Wizard
Connecting the Microphone
Insert the green microphone plug on the microphone headset into the microphone jack of your sound card.
The microphone jack is usually located on the back or side of the computer. It might be labeled with one of the following:
'Mic in', 'Mic', 'M',
< Back
Next >
Cancel
Help
194

FIG. 13

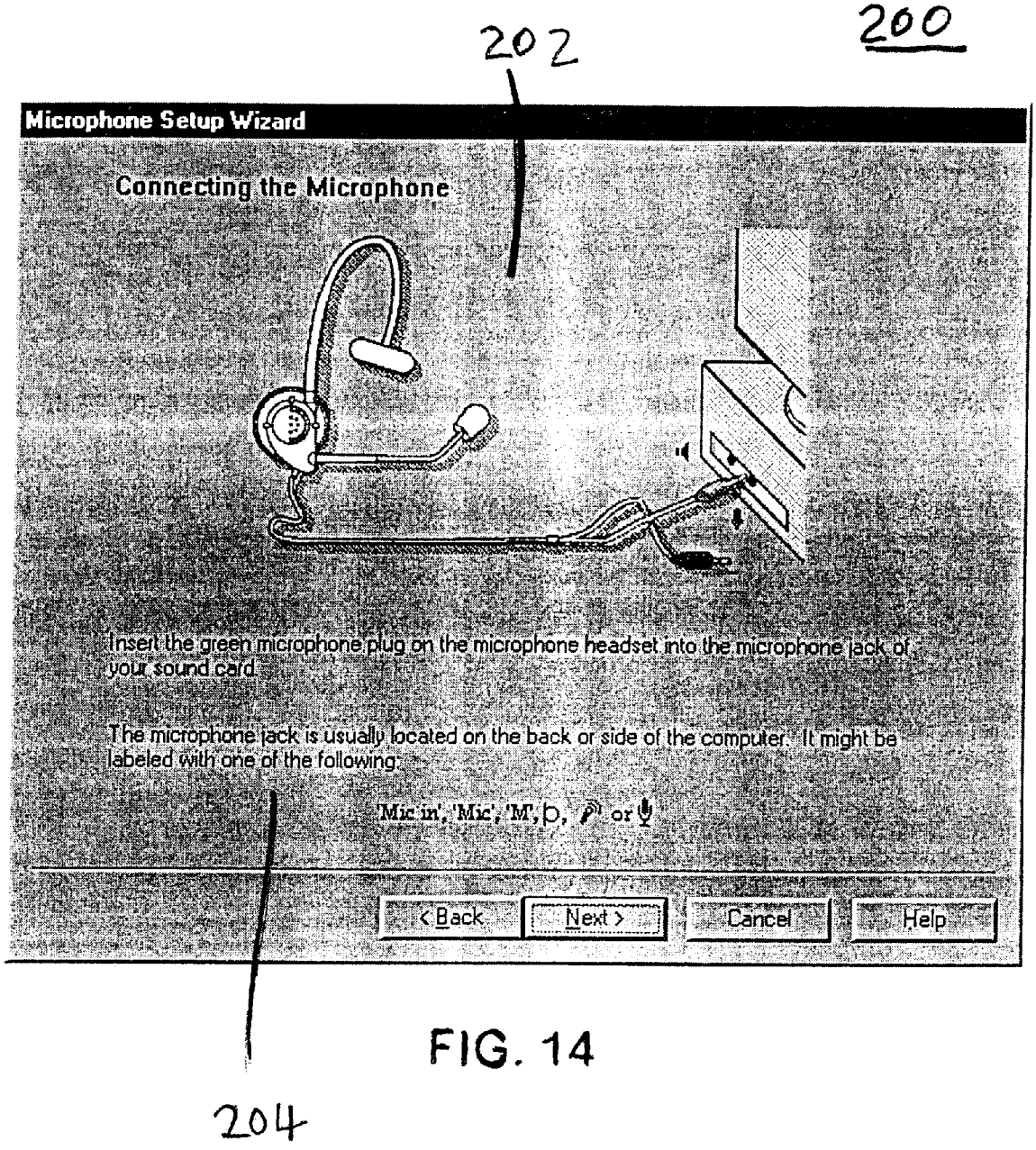

200
202
Microphone Setup Wizard
Connecting the Microphone
Insert the green microphone plug on the microphone headset into the microphone jack of your sound card.
The microphone jack is usually located on the back or side of the computer. It might be labeled with one of the following:
'Mic in', 'Mic', 'M', or
< Back
Next >
Cancel
Help
204

FIG. 14

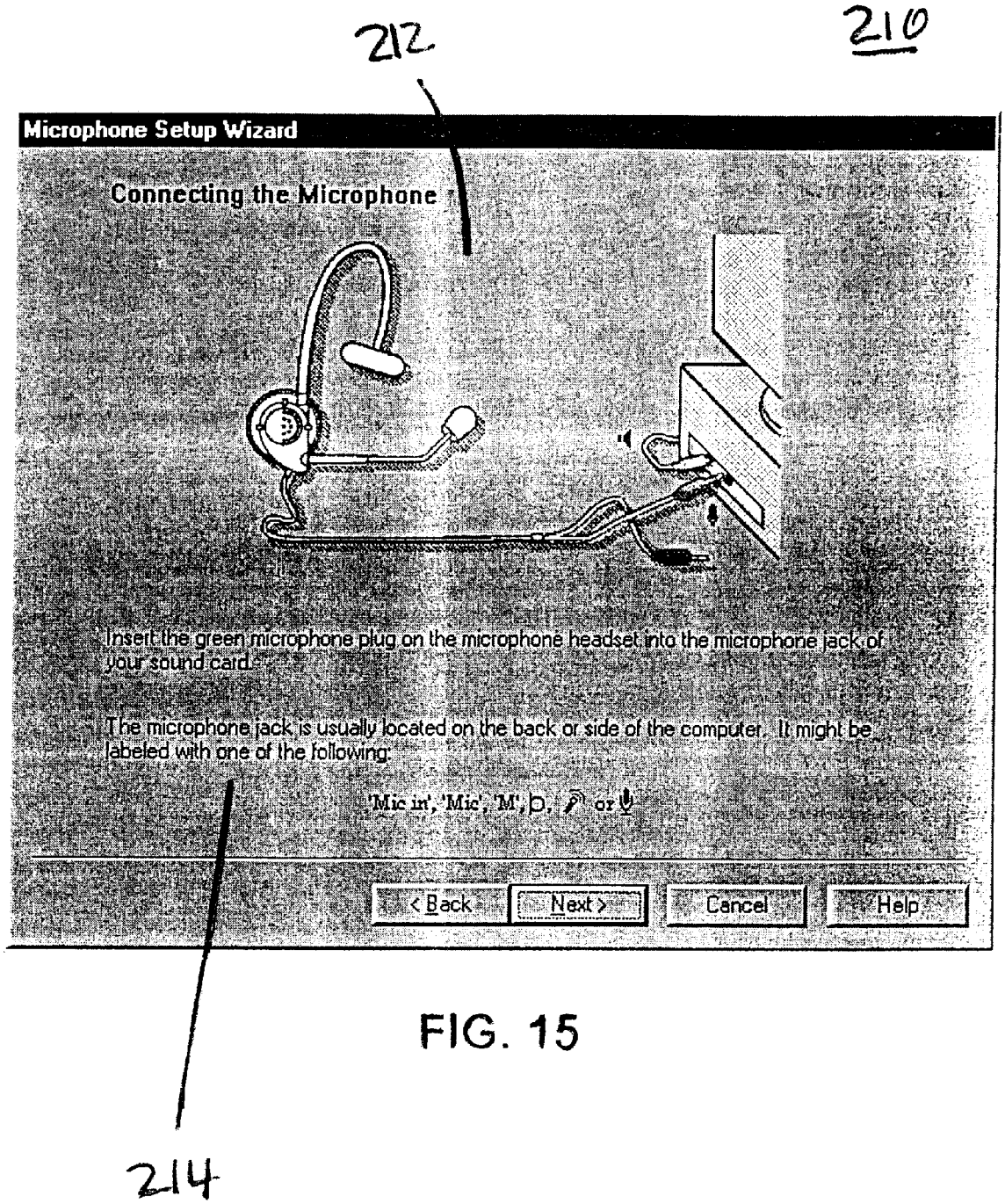

212
210
Microphone Setup Wizard
Connecting the Microphone
Insert the green microphone plug on the microphone headset into the microphone jack of your sound card.
The microphone jack is usually located on the back or side of the computer. It might be labeled with one of the following:
'Mic in', 'Mic', 'M', or
< Back
Next >
Cancel
Help
214

FIG. 15

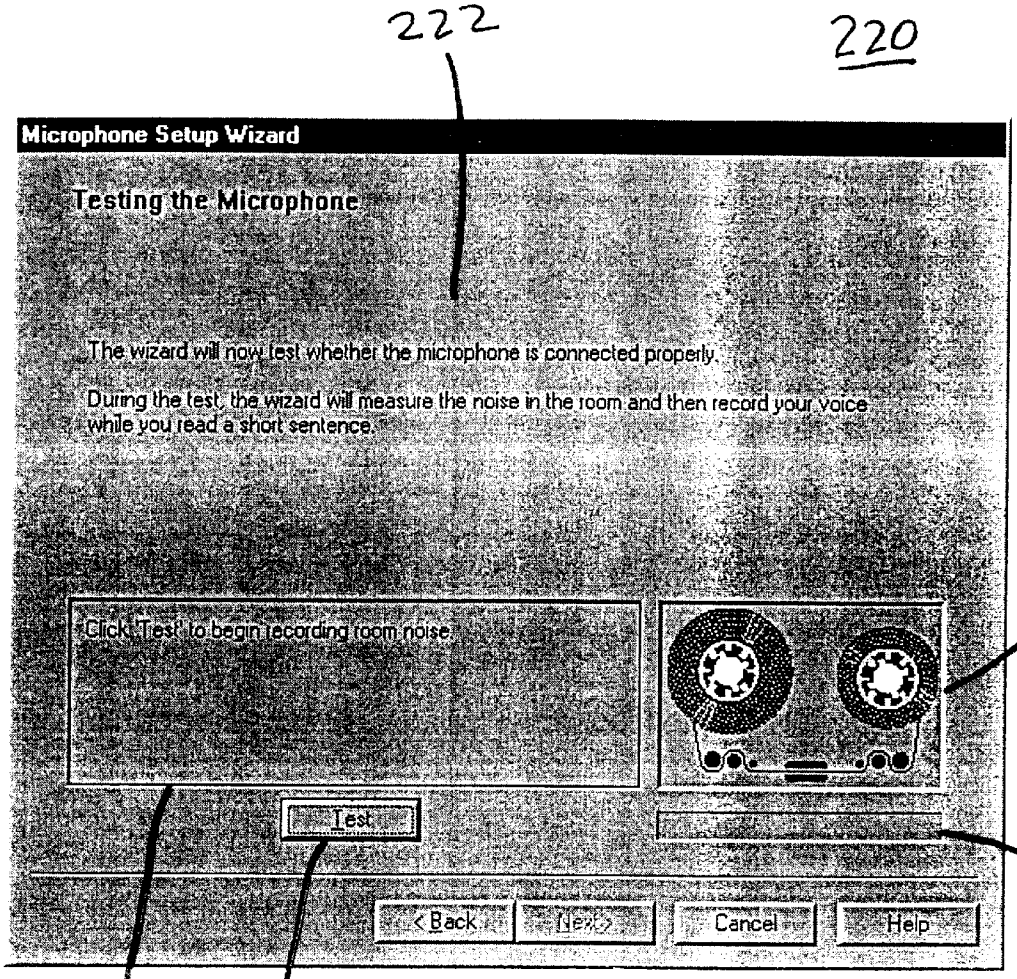

222
220
Microphone Setup Wizard
Testing the Microphone
The wizard will now test whether the microphone is connected properly.
During the test, the wizard will measure the noise in the room and then record your voice while you read a short sentence.
Click 'Test' to begin recording room noise.
Test
< Back
Next >
Cancel
Help
226
224
228
230

FIG. 16

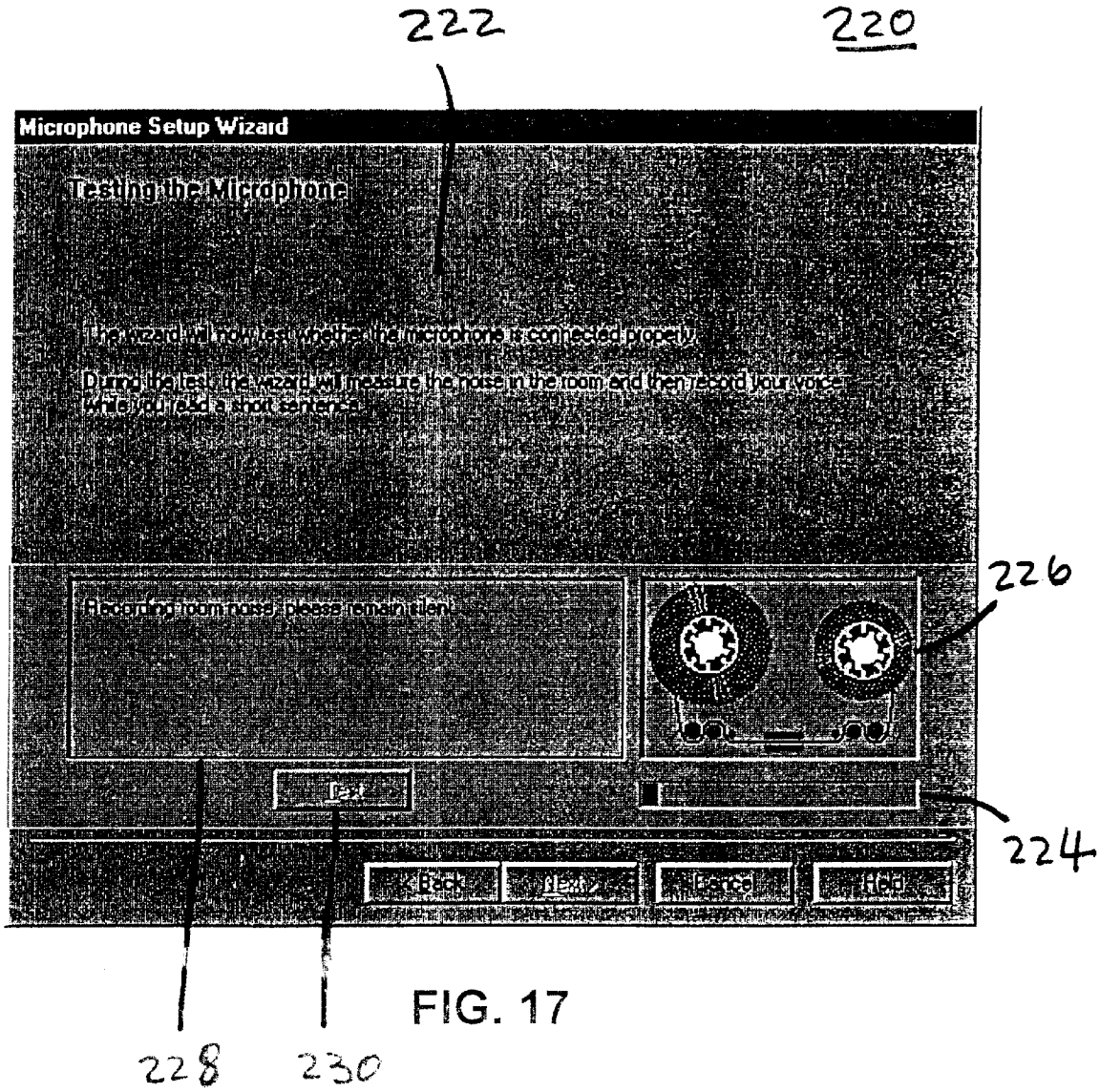

222
220
Microphone Setup Wizard
Testing the Microphone
Recording room noise: please remain silent...
Next
Back
Next >
Cancel
Help
226
224
228
230

FIG. 17

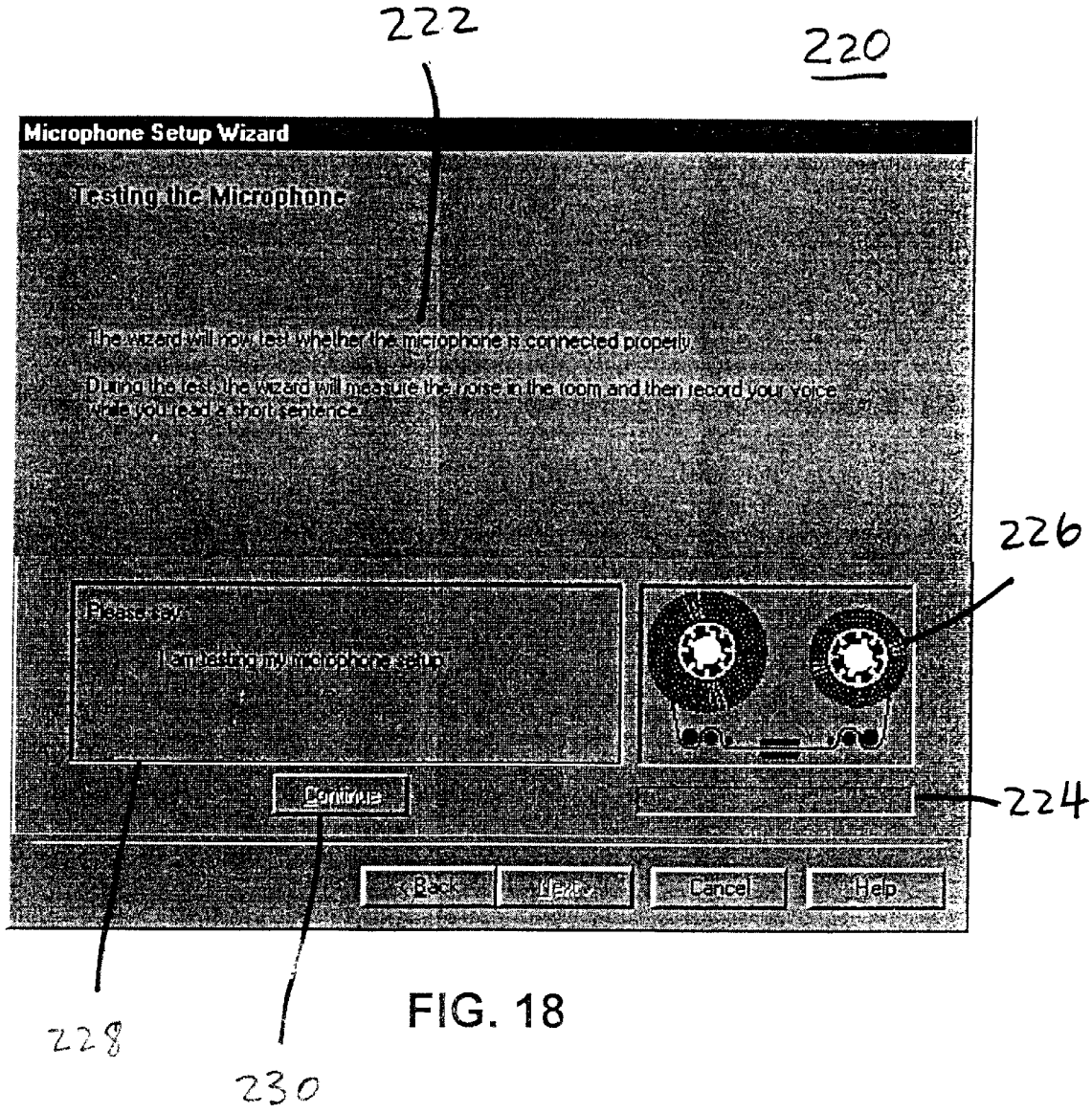

222
220
Microphone Setup Wizard
Testing the Microphone
The wizard will now test whether the microphone is connected properly.
During the test the wizard will measure the noise in the room and then record your voice
while you read a short sentence.
Please say:
"I am testing my microphone setup."
Continue
226
224
< Back
Next >
Cancel
Help
228
230

FIG. 18

220

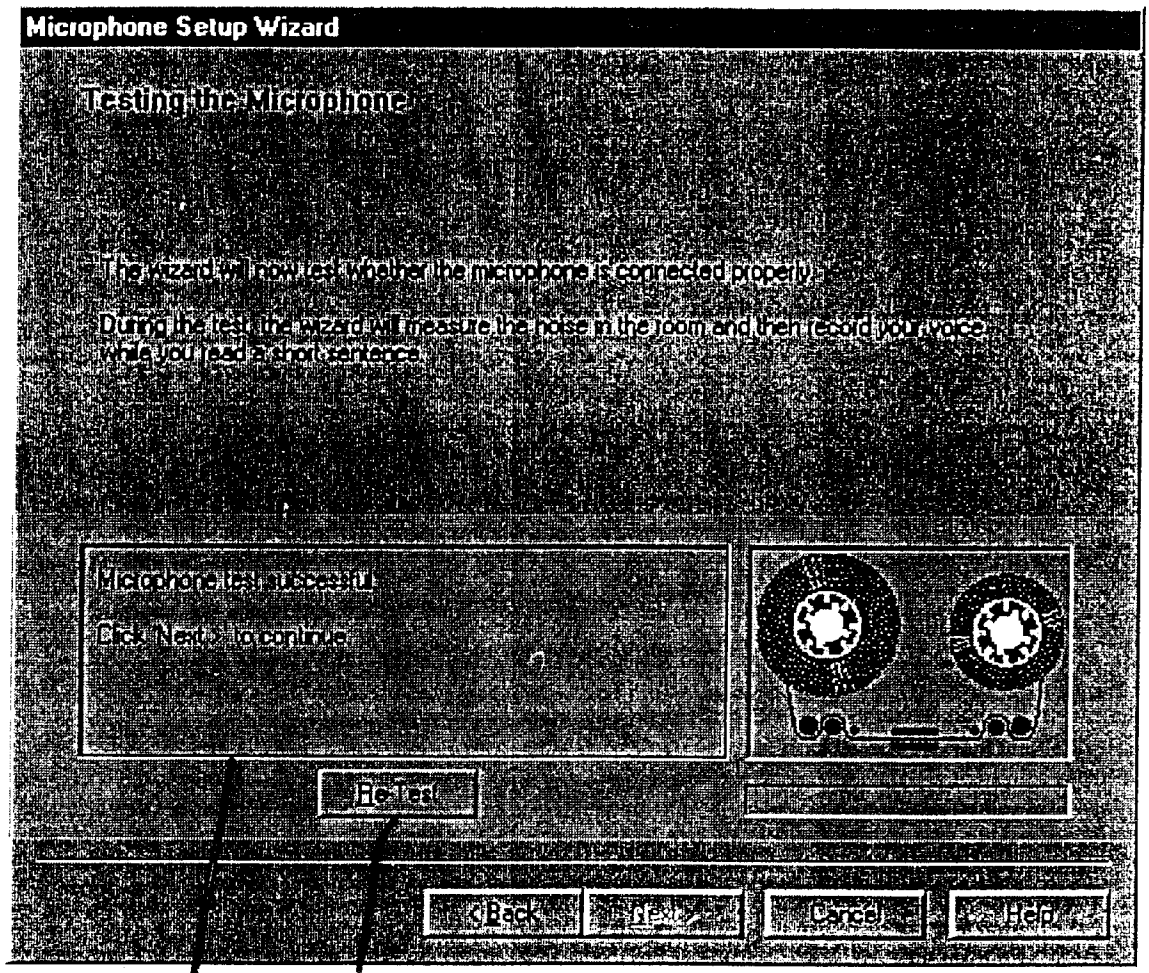

Microphone Setup Wizard
Testing the Microphone
The wizard will now test whether the microphone is connected properly.
During the test the wizard will measure the noise in the room and then record your voice while you read a short sentence.
Microphone test successful.
Click Next to continue.
Re-Test
< Back
Next >
Cancel
Help
228
230

FIG. 19

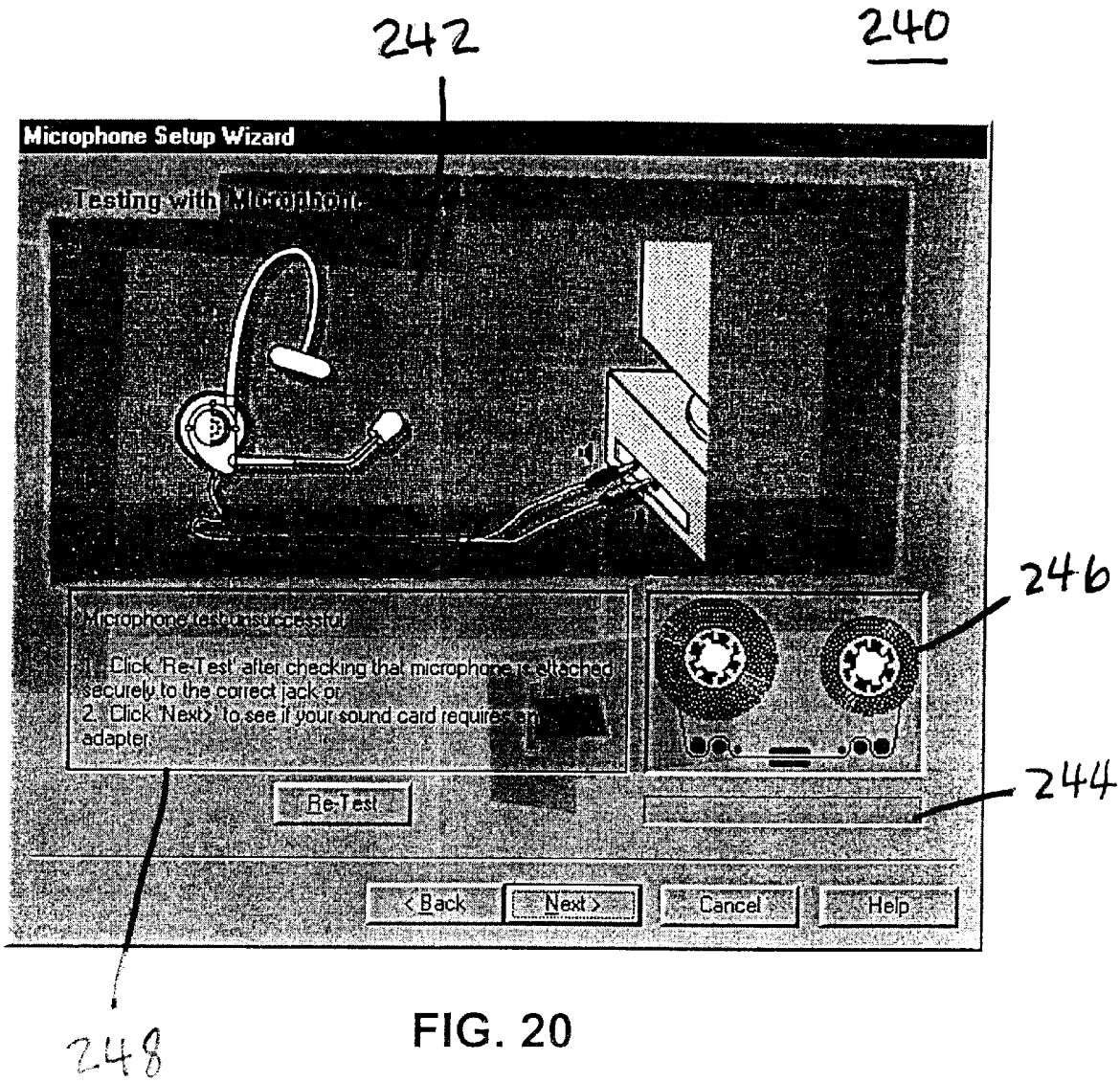

242
240
Microphone Setup Wizard
Testing with Microphone
246
1. Click 'Re-Test' after checking that microphone is attached securely to the correct jack or
2. Click 'Next' to see if your sound card requires an adapter.
Re-Test
244
< Back
Next >
Cancel
Help
248

FIG. 20

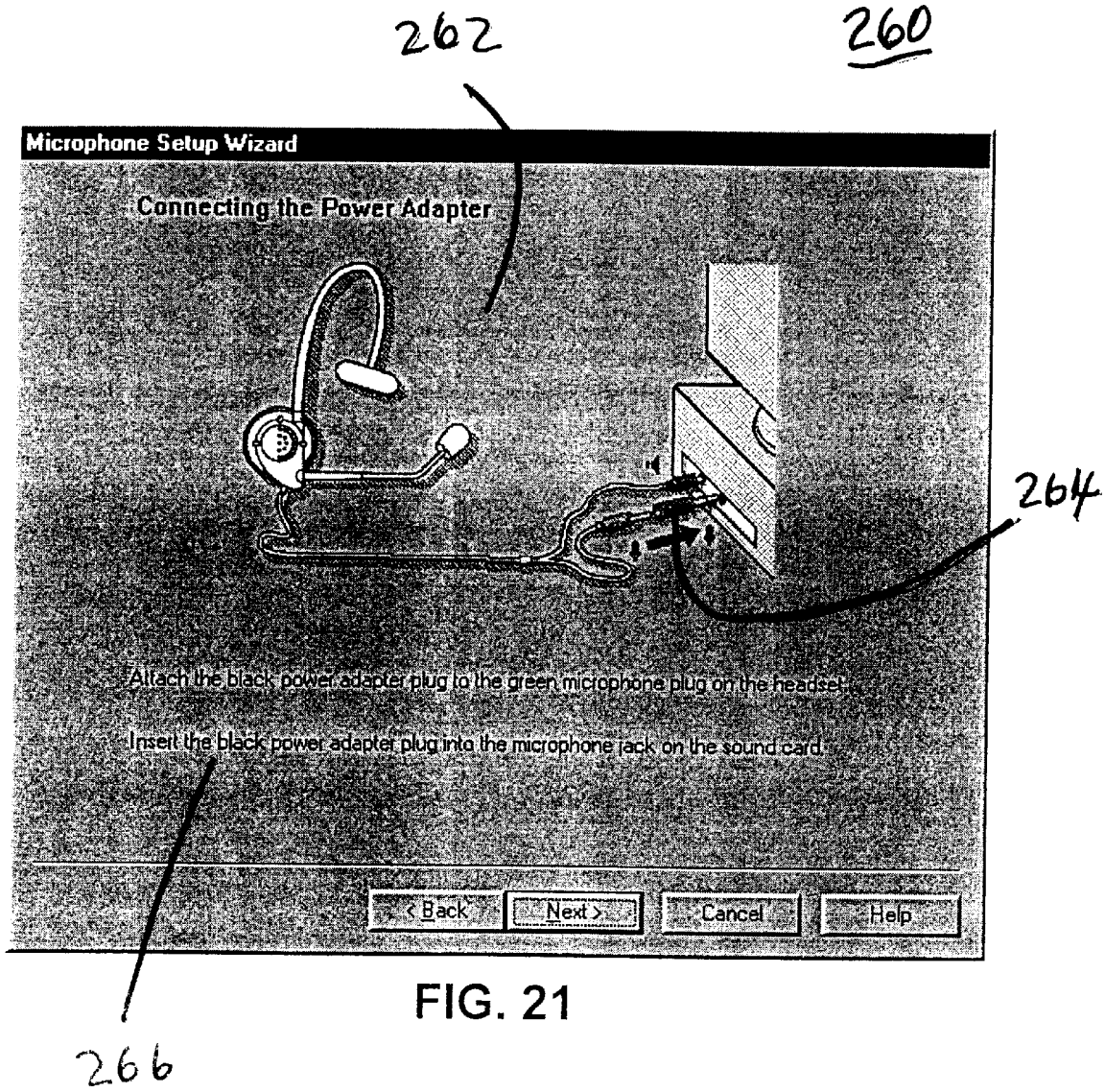

262
260
Microphone Setup Wizard
Connecting the Power Adapter
264
Attach the black power adapter plug to the green microphone plug on the headset.
Insert the black power adapter plug into the microphone jack on the sound card.
< Back
Next >
Cancel
Help
266

FIG. 21

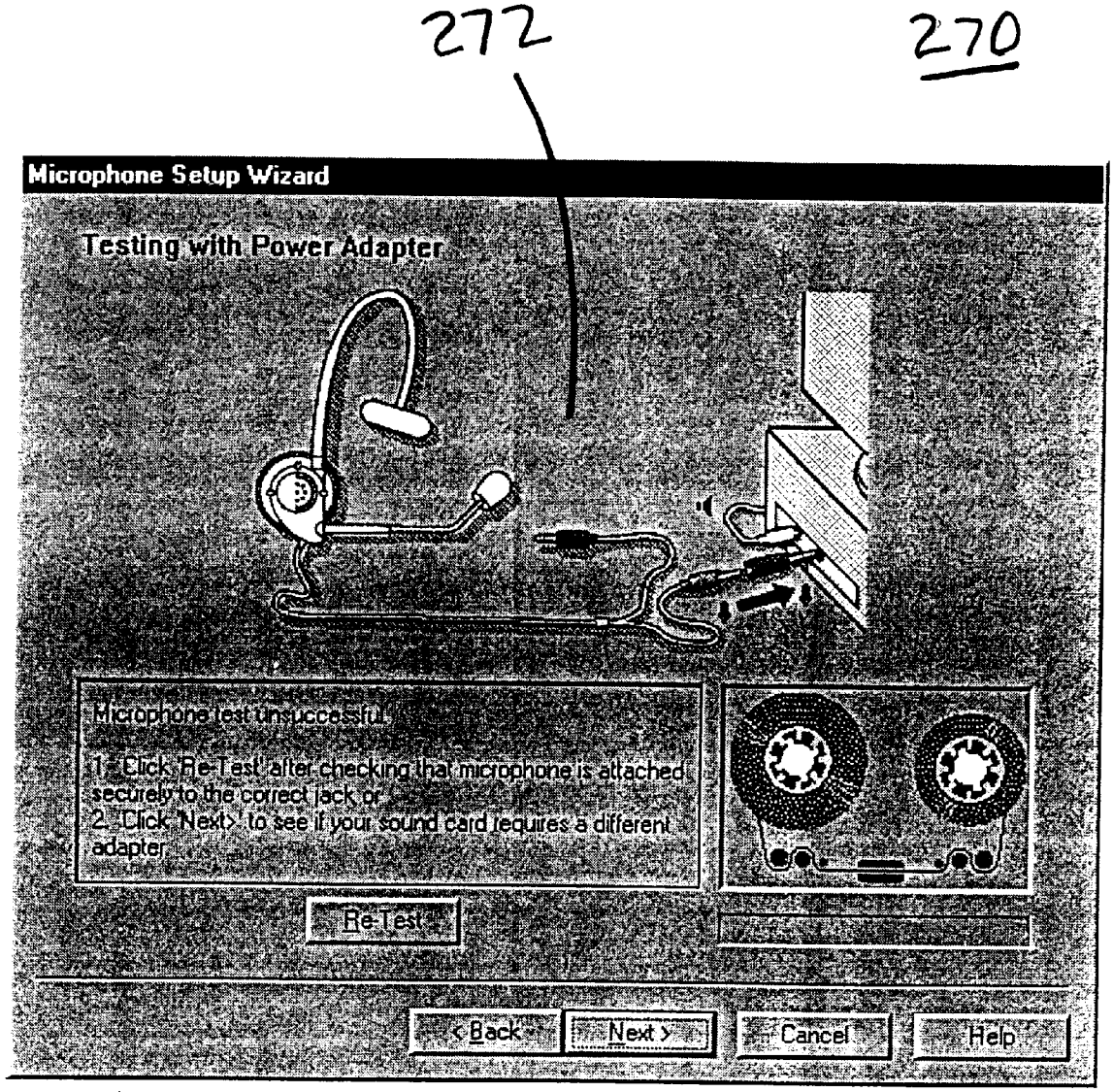

272
270
Microphone Setup Wizard
Testing with Power Adapter
Microphone test unsuccessful.
1. Click 'Re-Test' after checking that microphone is attached securely to the correct jack, or
2. Click 'Next>' to see if your sound card requires a different adapter.
Re-Test...
< Back
Next >
Cancel
Help

FIG. 22

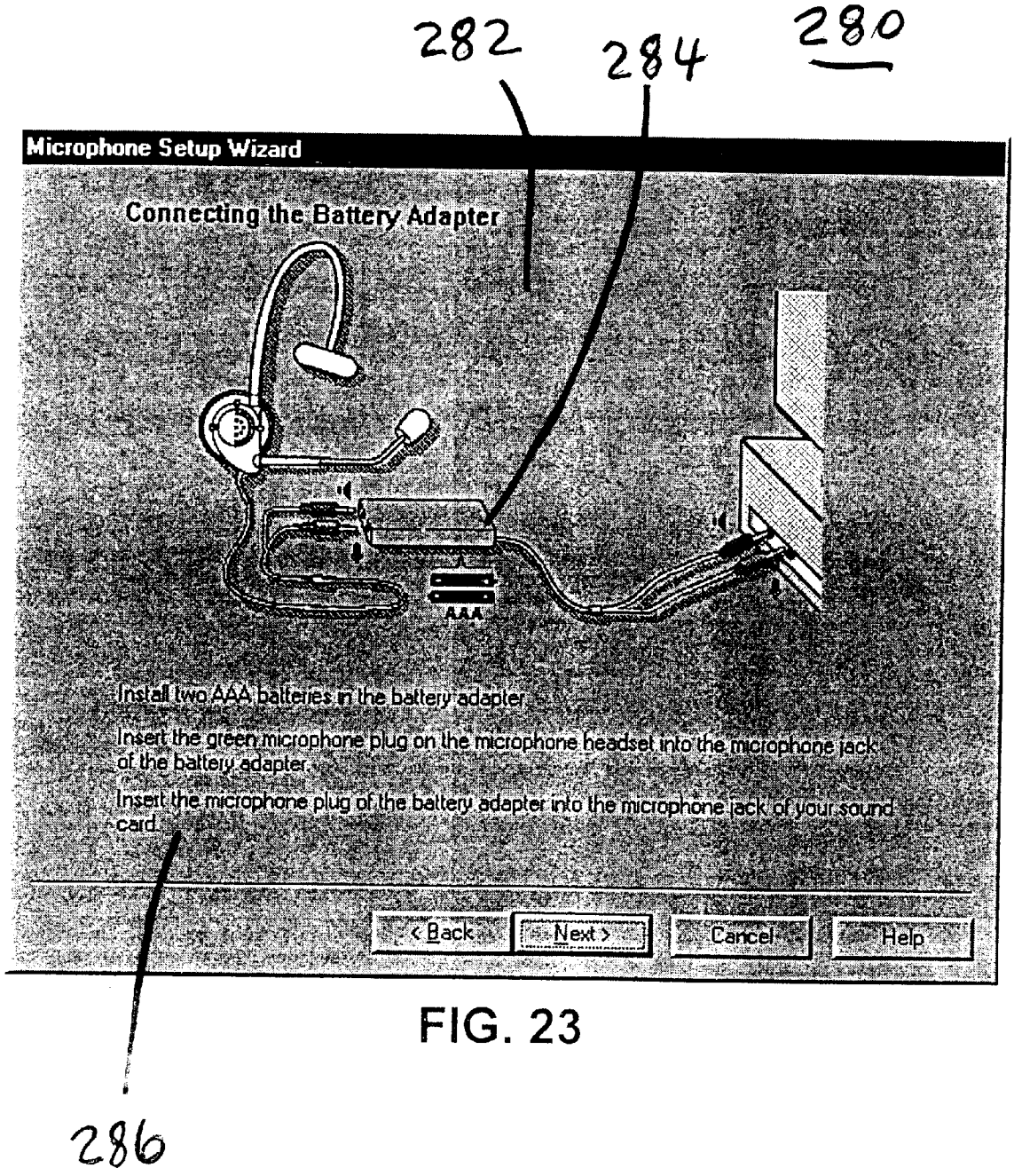

282
284
280
Microphone Setup Wizard
Connecting the Battery Adapter
AAA
Install two AAA batteries in the battery adapter.
Insert the green microphone plug on the microphone headset into the microphone jack of the battery adapter.
Insert the microphone plug of the battery adapter into the microphone jack of your sound card.
< Back
Next >
Cancel
Help
286

FIG. 23

290

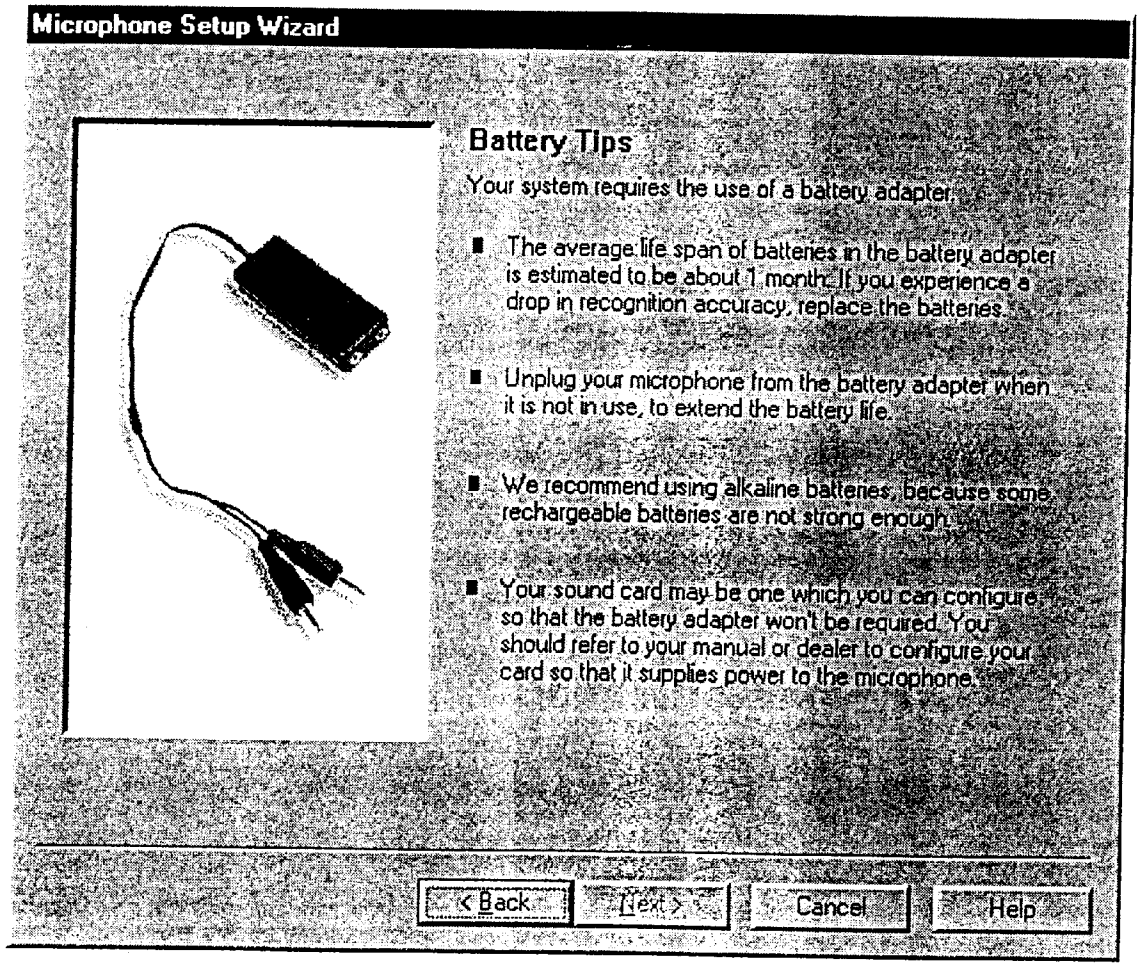

Microphone Setup Wizard
Battery Tips
Your system requires the use of a battery adapter.
The average life span of batteries in the battery adapter is estimated to be about 1 month. If you experience a drop in recognition accuracy, replace the batteries.
Unplug your microphone from the battery adapter when it is not in use, to extend the battery life.
We recommend using alkaline batteries, because some rechargeable batteries are not strong enough.
Your sound card may be one which you can configure so that the battery adapter won't be required. You should refer to your manual or dealer to configure your card so that it supplies power to the microphone.
< Back
Next >
Cancel
Help

FIG. 24

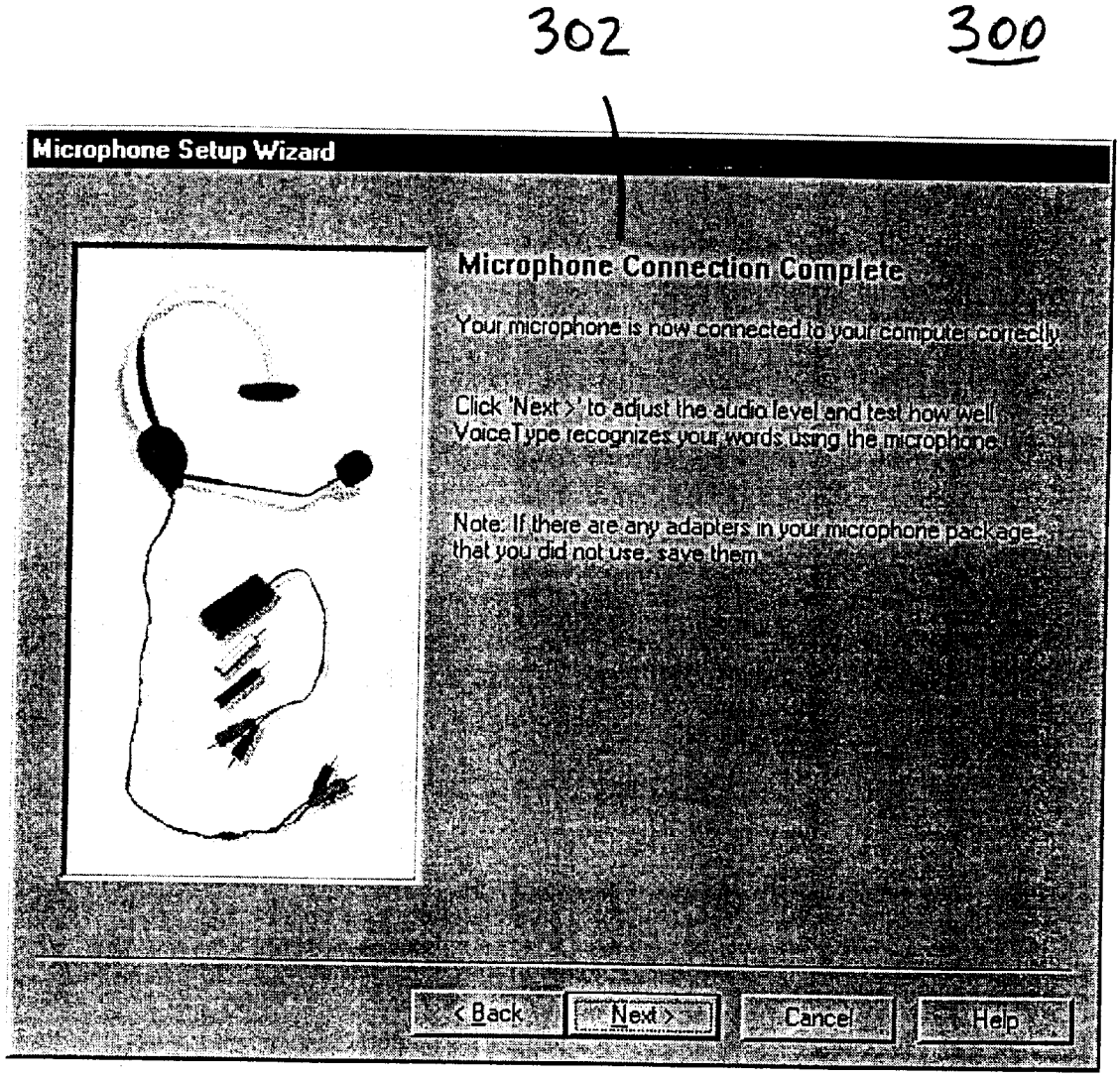

302
300
Microphone Setup Wizard
Microphone Connection Complete
Your microphone is now connected to your computer correctly.
Click 'Next >' to adjust the audio level and test how well VoiceType recognizes your words using the microphone.
Note: If there are any adapters in your microphone package that you did not use, save them.
< Back
Next >
Cancel
Help

FIG. 25

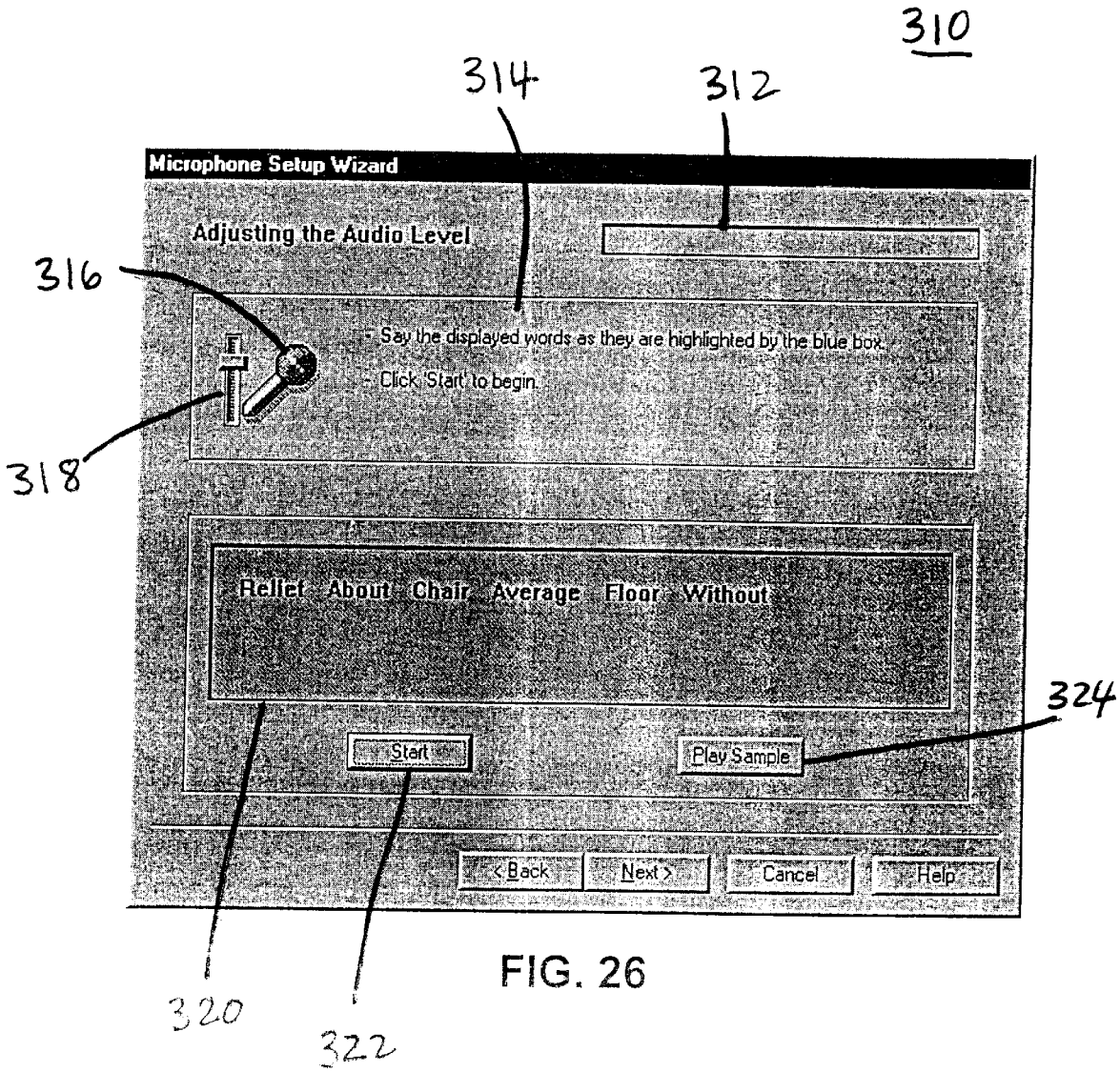

310
314
312
Microphone Setup Wizard
Adjusting the Audio Level
316
- Say the displayed words as they are highlighted by the blue box.
- Click 'Start' to begin.
318
Relief About Chair Average Floor Without
324
Start
Play Sample
< Back
Next >
Cancel
Help
320
322

FIG. 26

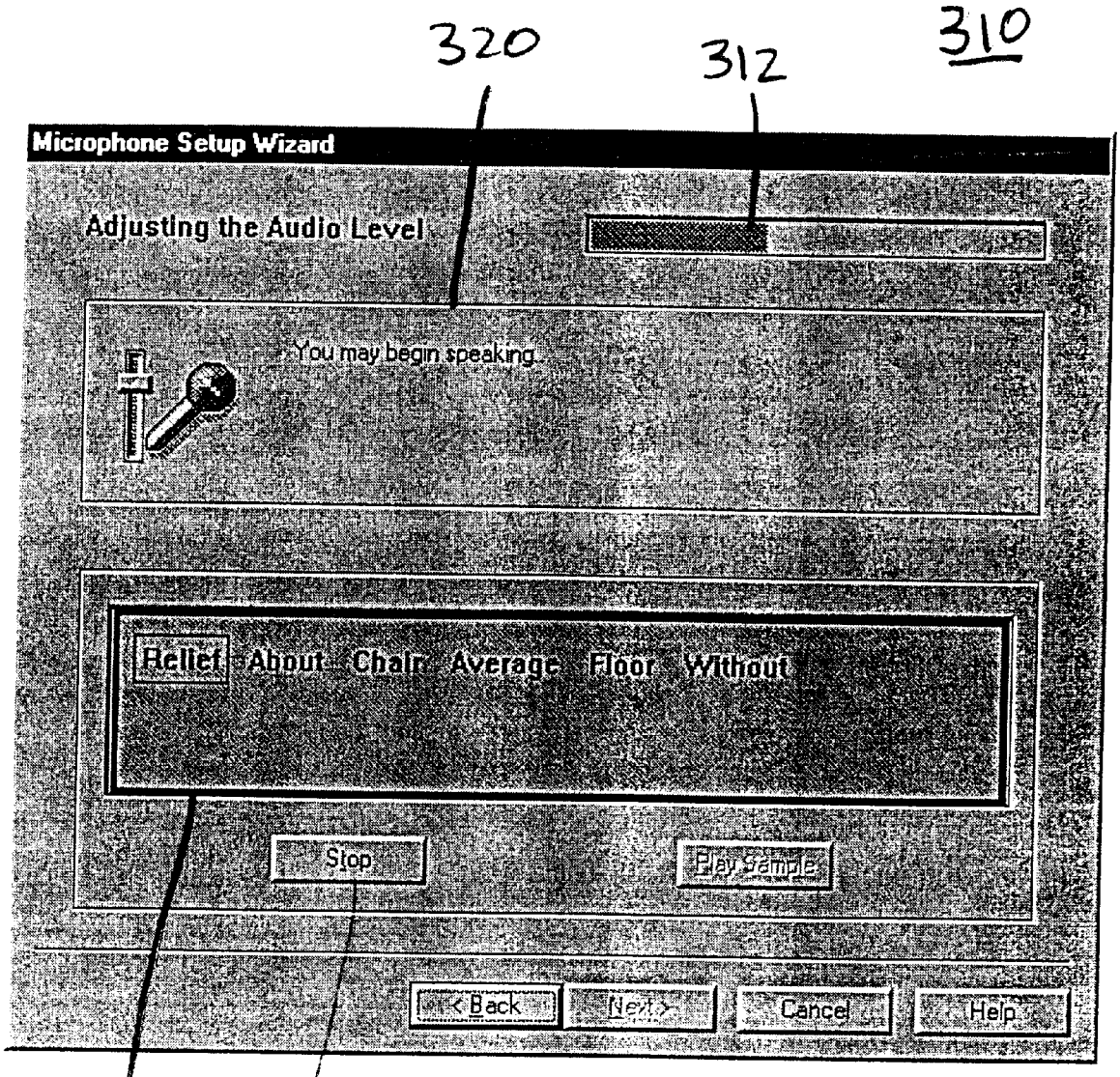

320
312
310
Microphone Setup Wizard
Adjusting the Audio Level
You may begin speaking.
Relief About Chair Average Floor Without
Stop
Play Sample
< Back
Next >
Cancel
Help
320
322

FIG. 27

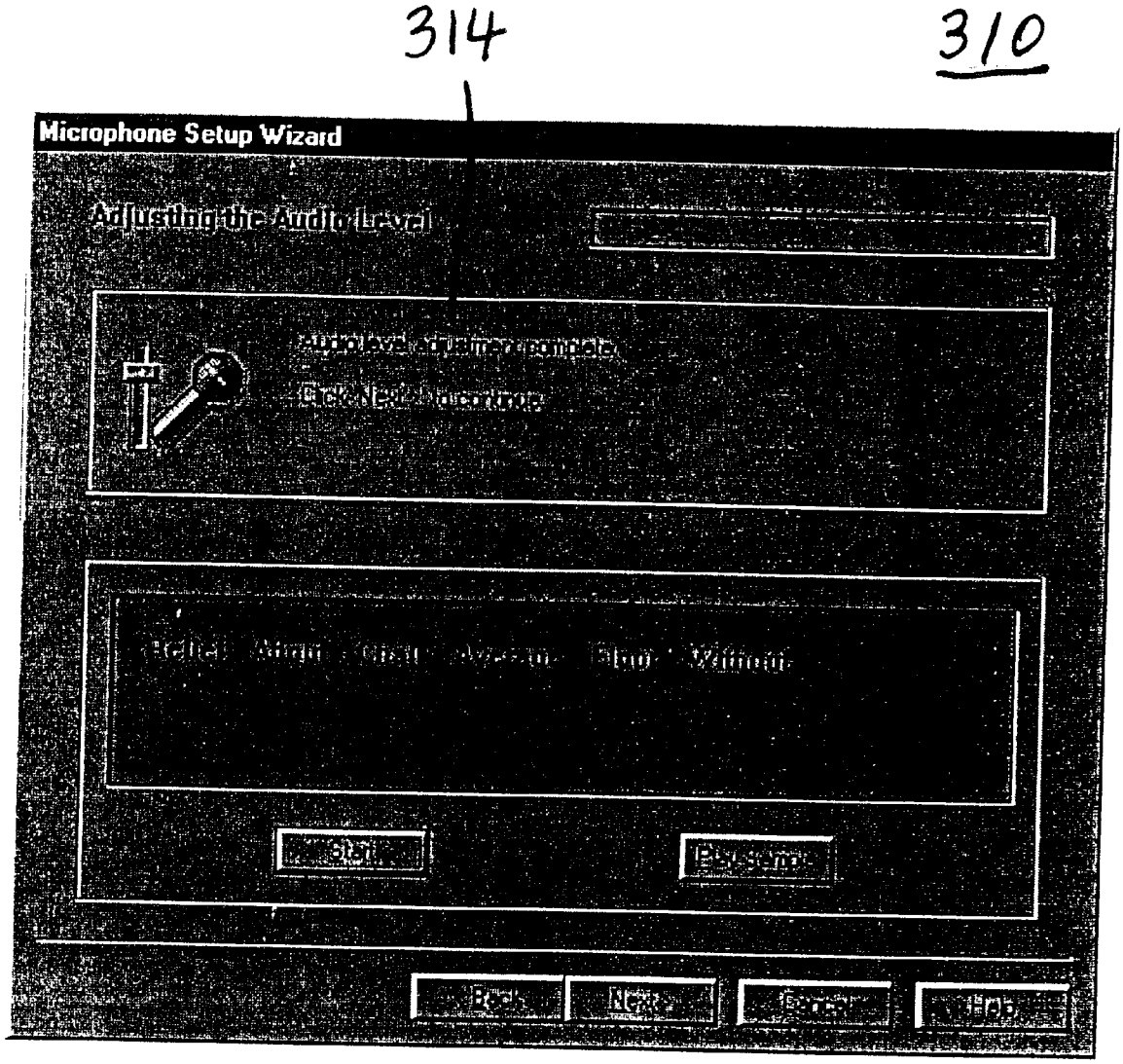

314
310
Microphone Setup Wizard
Adjusting the Audio Level
Back
Next
Cancel
Help

FIG. 28

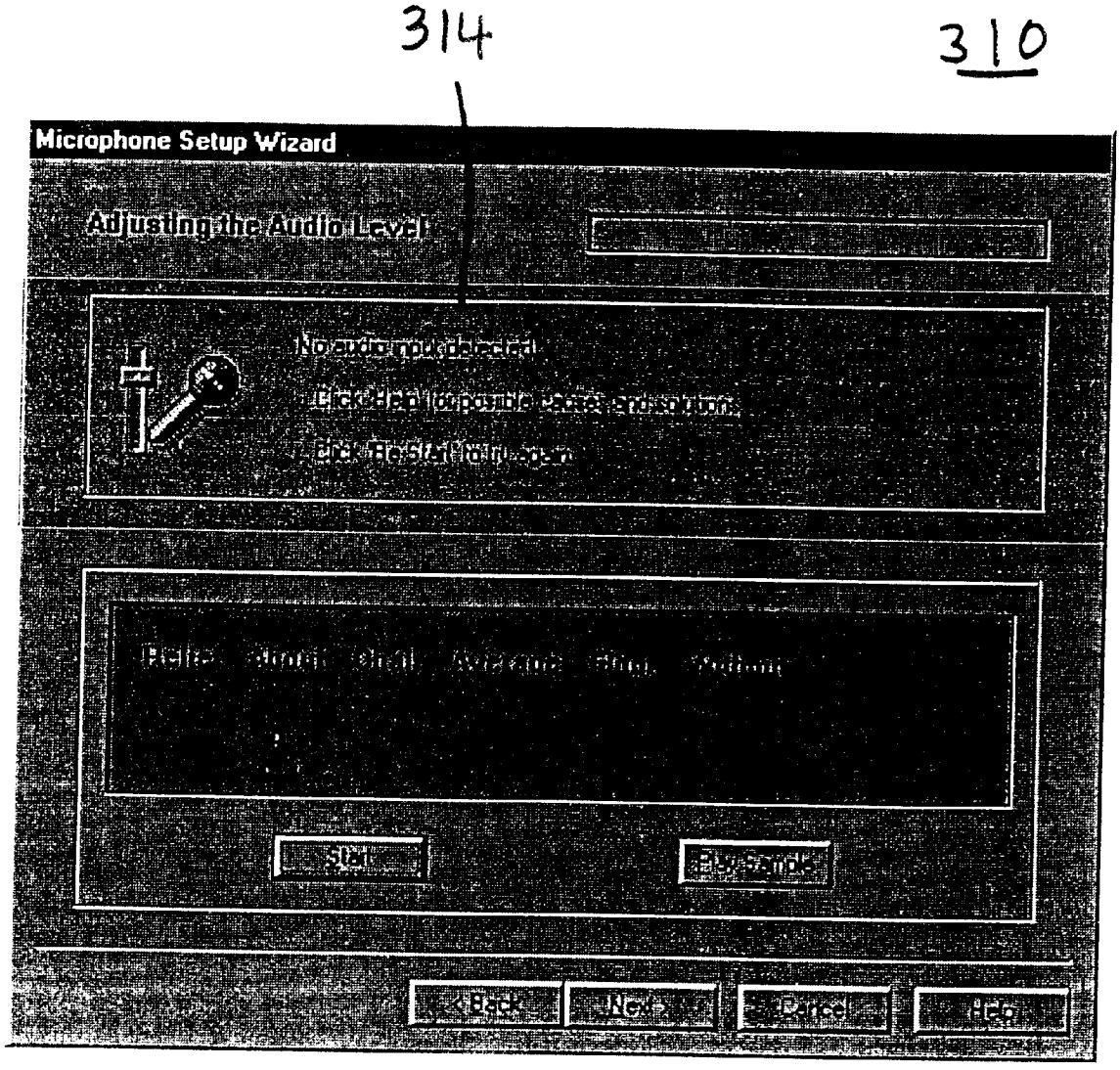

314
310
Microphone Setup Wizard
Adjusting the Audio Level
Start
< Back
Next >
Cancel
Help

FIG. 29

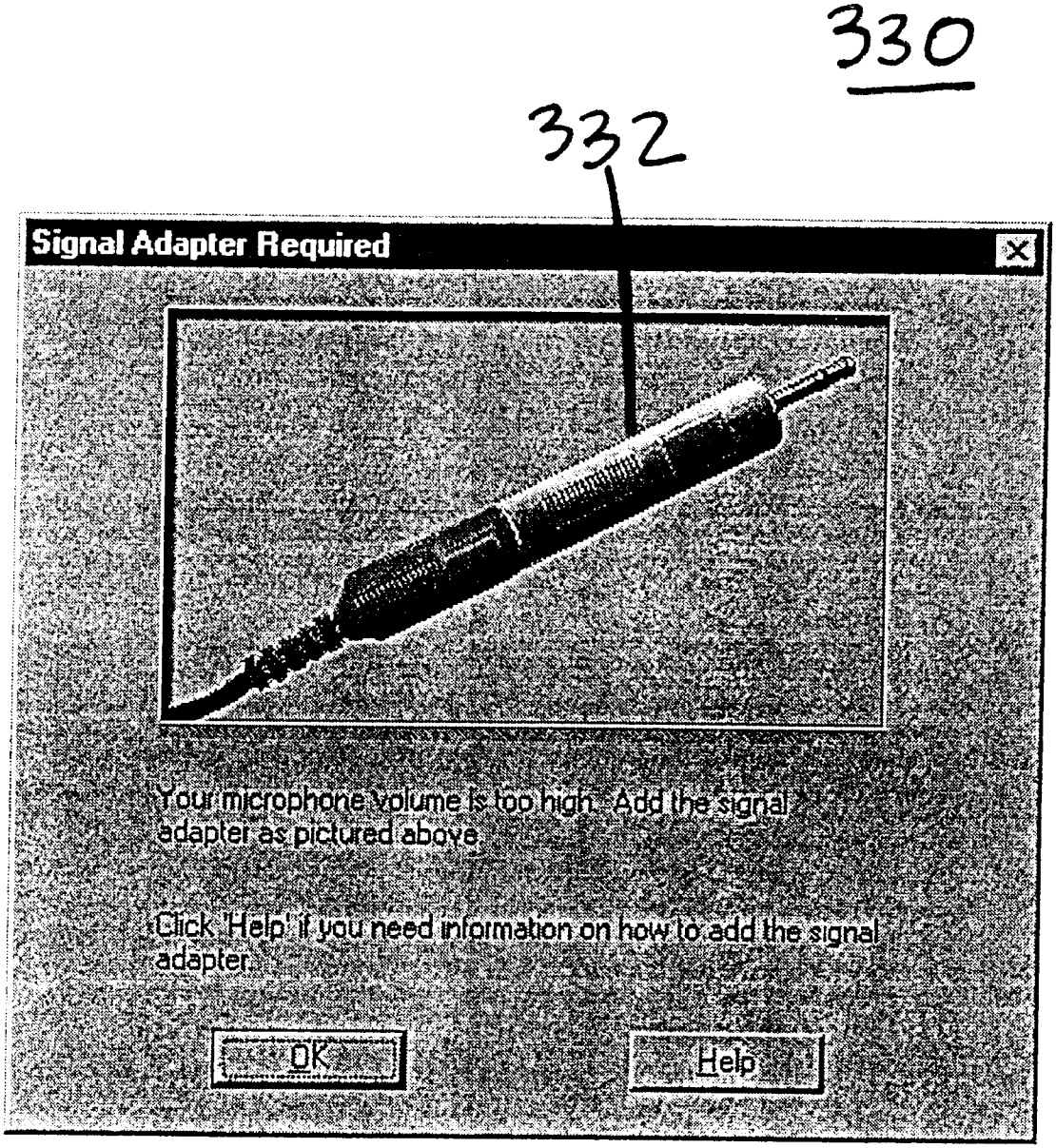

330
332
Signal Adapter Required
Your microphone volume is too high. Add the signal adapter as pictured above.
Click 'Help' if you need information on how to add the signal adapter.
OK
Help

FIG. 30

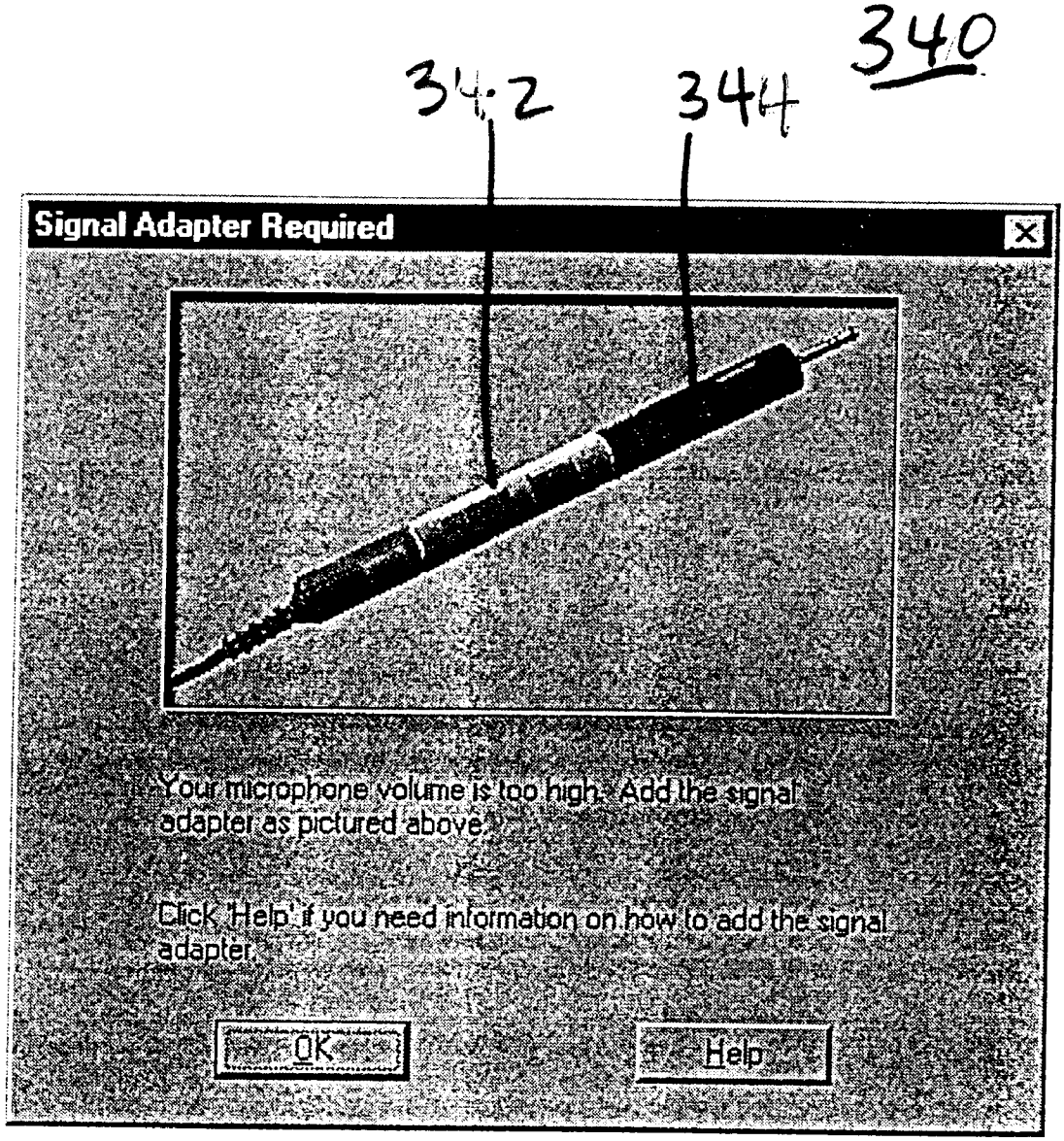

340
342
344
Signal Adapter Required
Your microphone volume is too high. Add the signal adapter as pictured above.
Click 'Help' if you need information on how to add the signal adapter.
OK
Help

FIG. 31

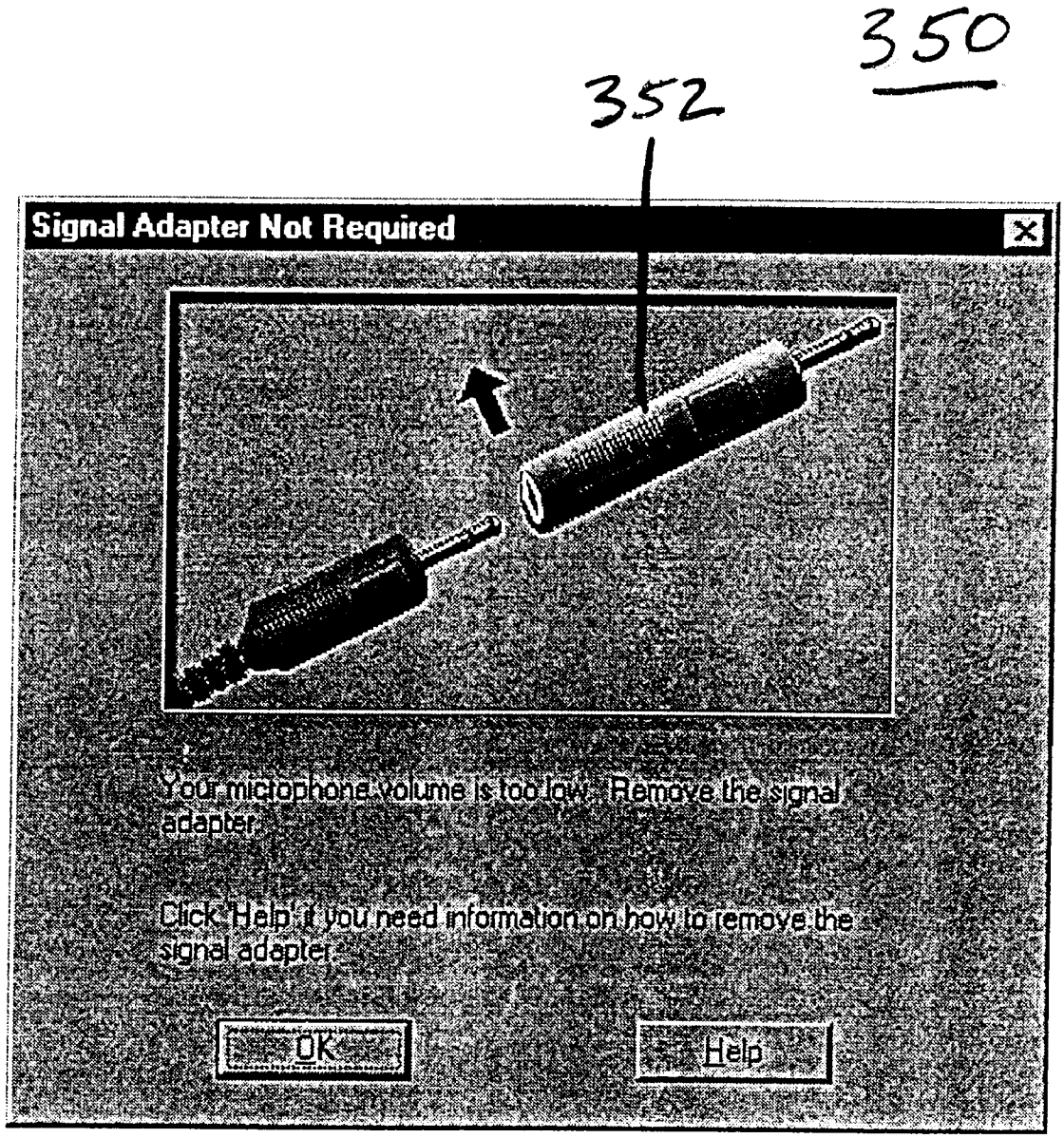

350
352
Signal Adapter Not Required
Your microphone volume is too low. Remove the signal adapter.
Click 'Help' if you need information on how to remove the signal adapter.
OK
Help

FIG. 32

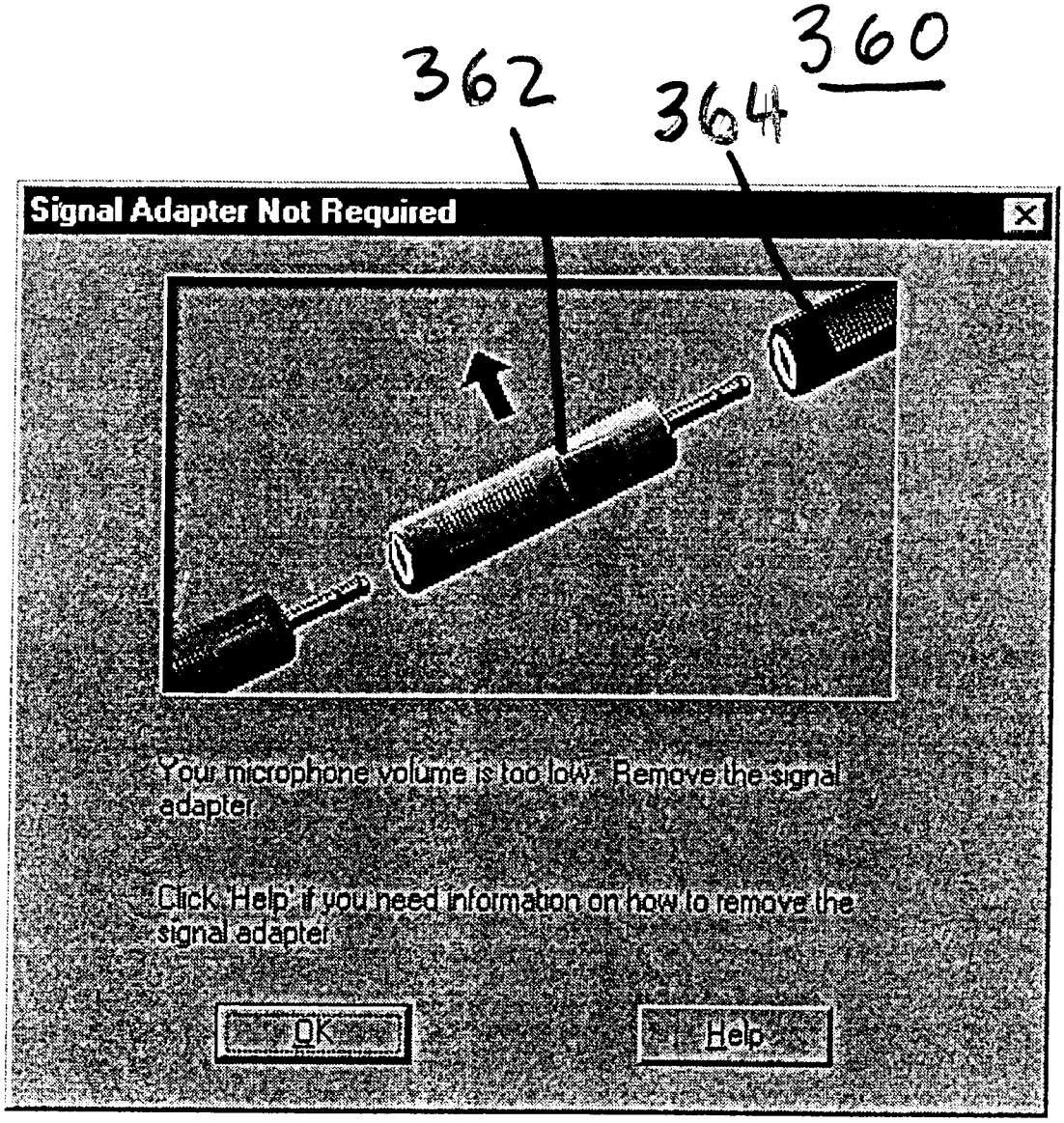

362
364
360
Signal Adapter Not Required
Your microphone volume is too low. Remove the signal adapter.
Click 'Help' if you need information on how to remove the signal adapter.
OK
Help

FIG. 33

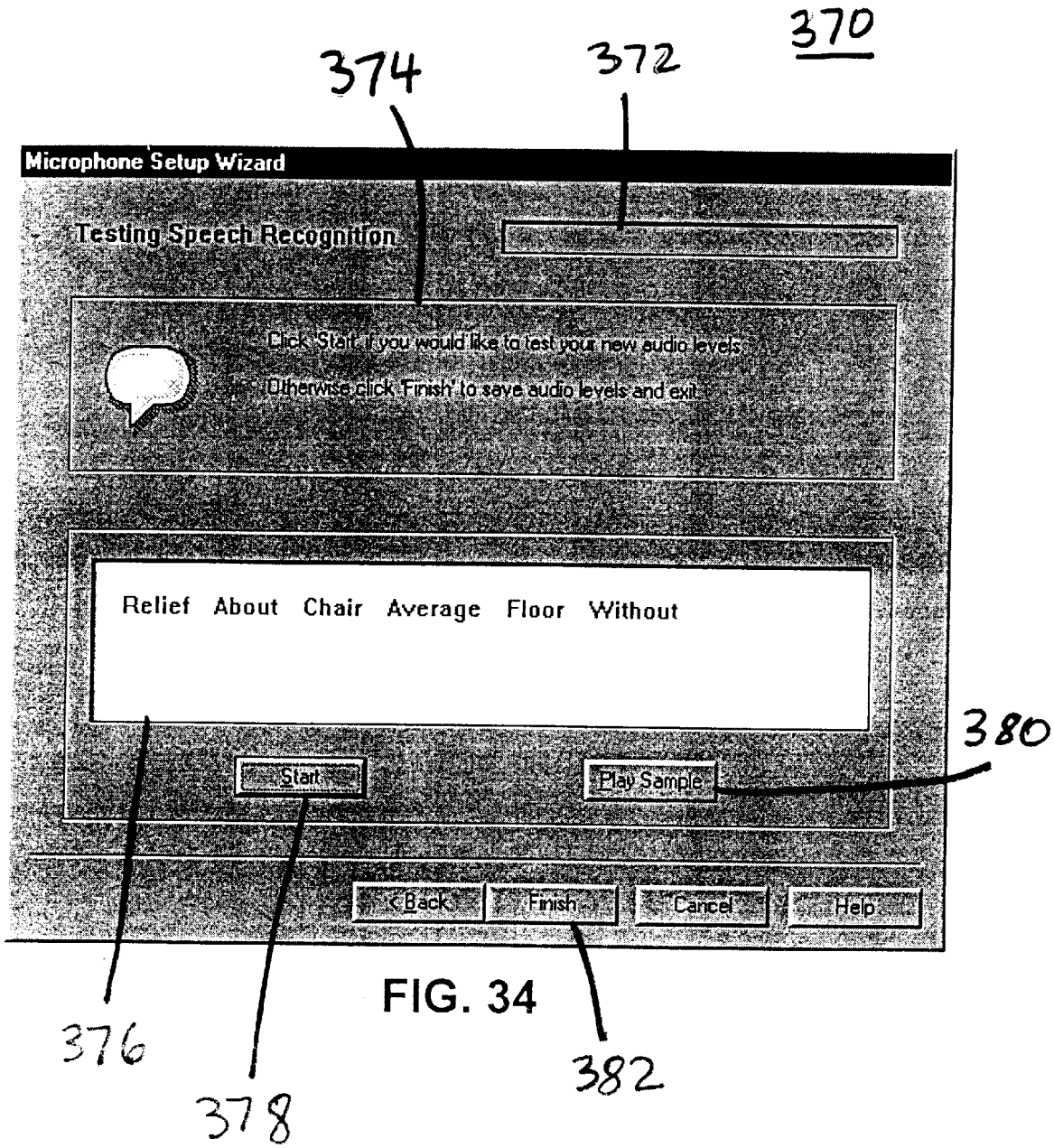

370
374
372
Microphone Setup Wizard
Testing Speech Recognition
Click 'Start' if you would like to test your new audio levels.
Otherwise click 'Finish' to save audio levels and exit.
Relief About Chair Average Floor Without
Start
Play Sample
380
< Back
Finish
Cancel
Help
376
378
382

FIG. 34

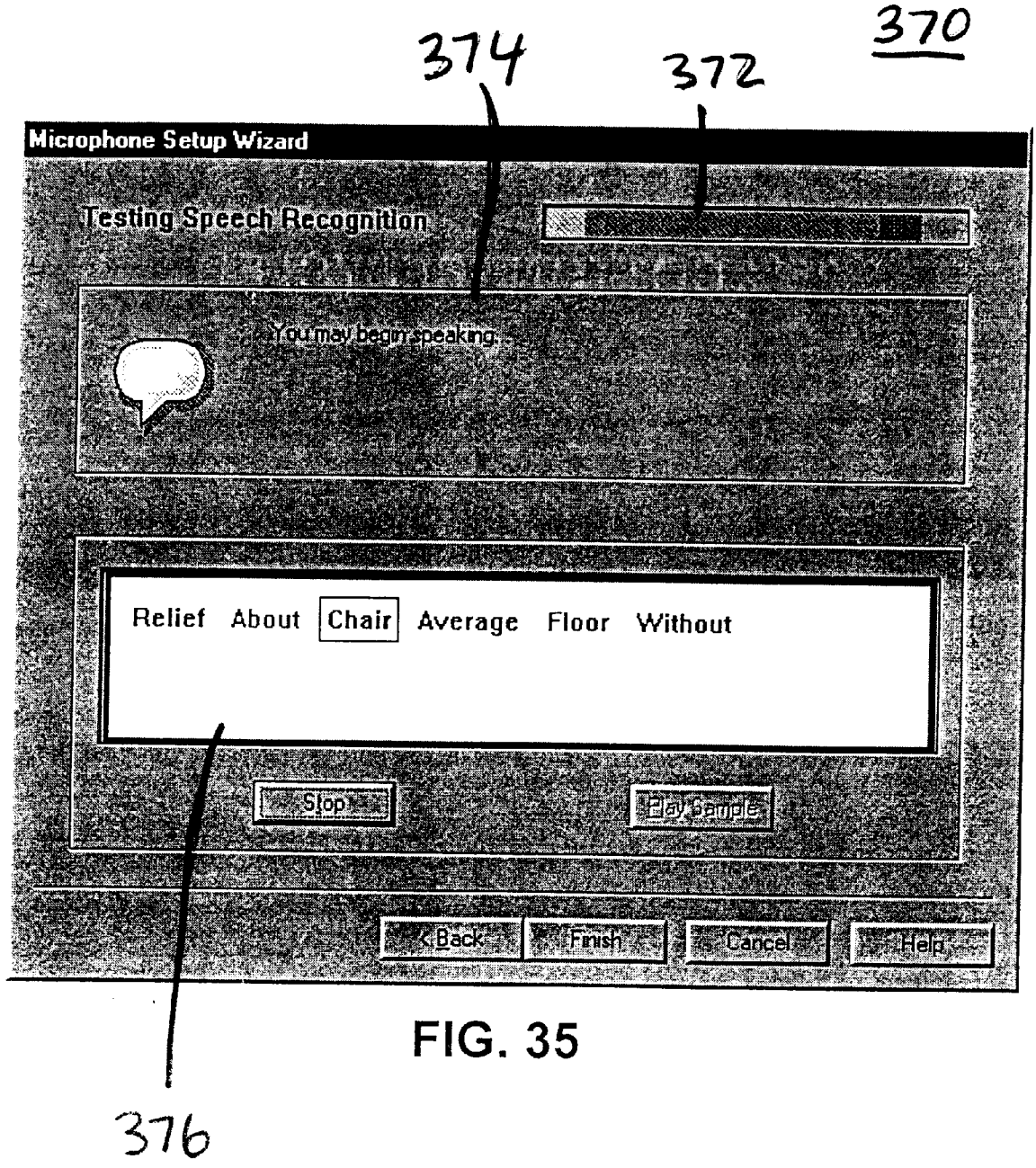

370
374
372
Microphone Setup Wizard
Testing Speech Recognition
You may begin speaking.
Relief About Chair Average Floor Without
Stop
Play Sample
< Back
Finish
Cancel
Help
376

FIG. 35

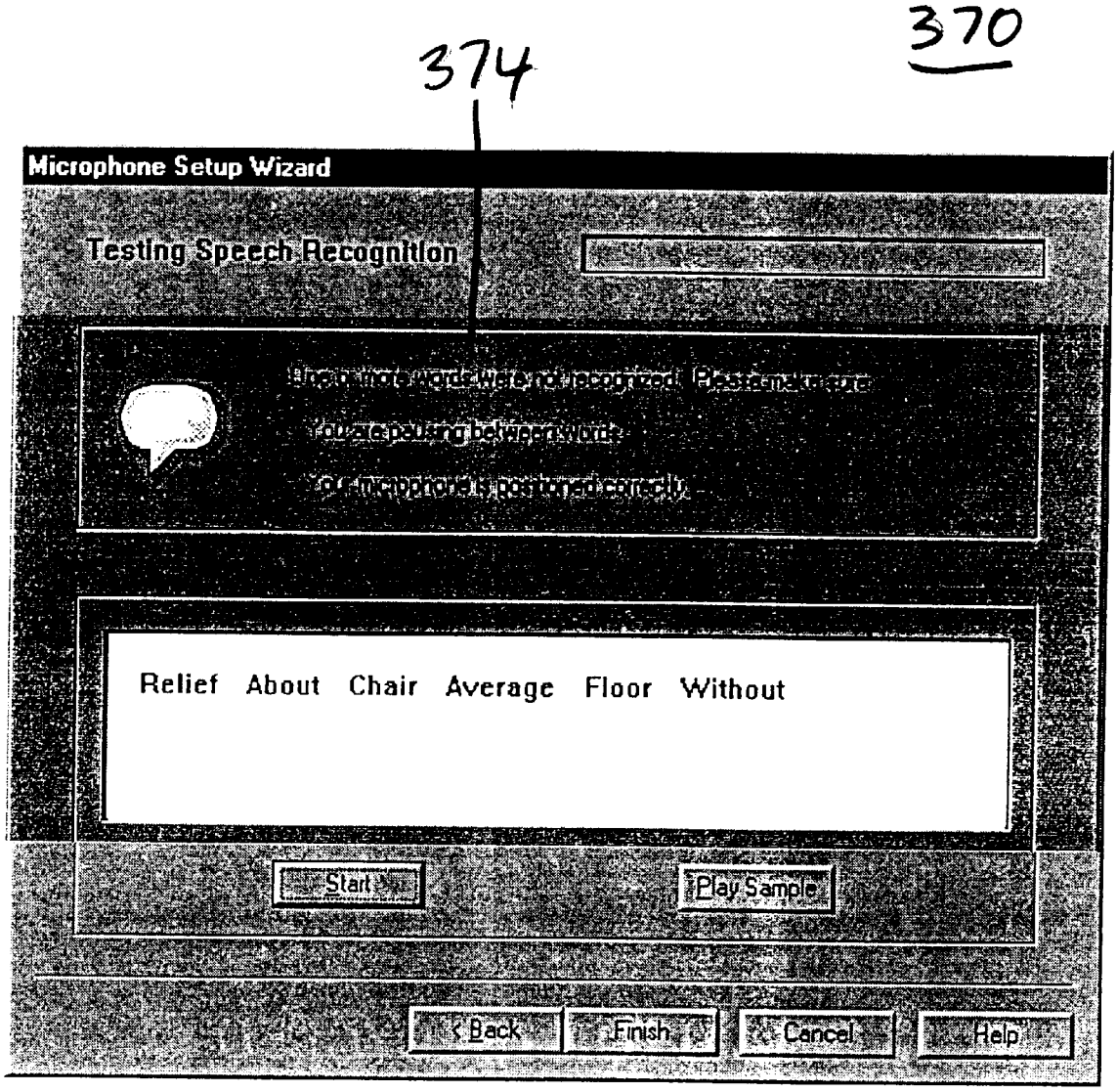

370
374
Microphone Setup Wizard
Testing Speech Recognition
Relief About Chair Average Floor Without
Start
Play Sample
< Back
Finish
Cancel
Help

FIG. 36

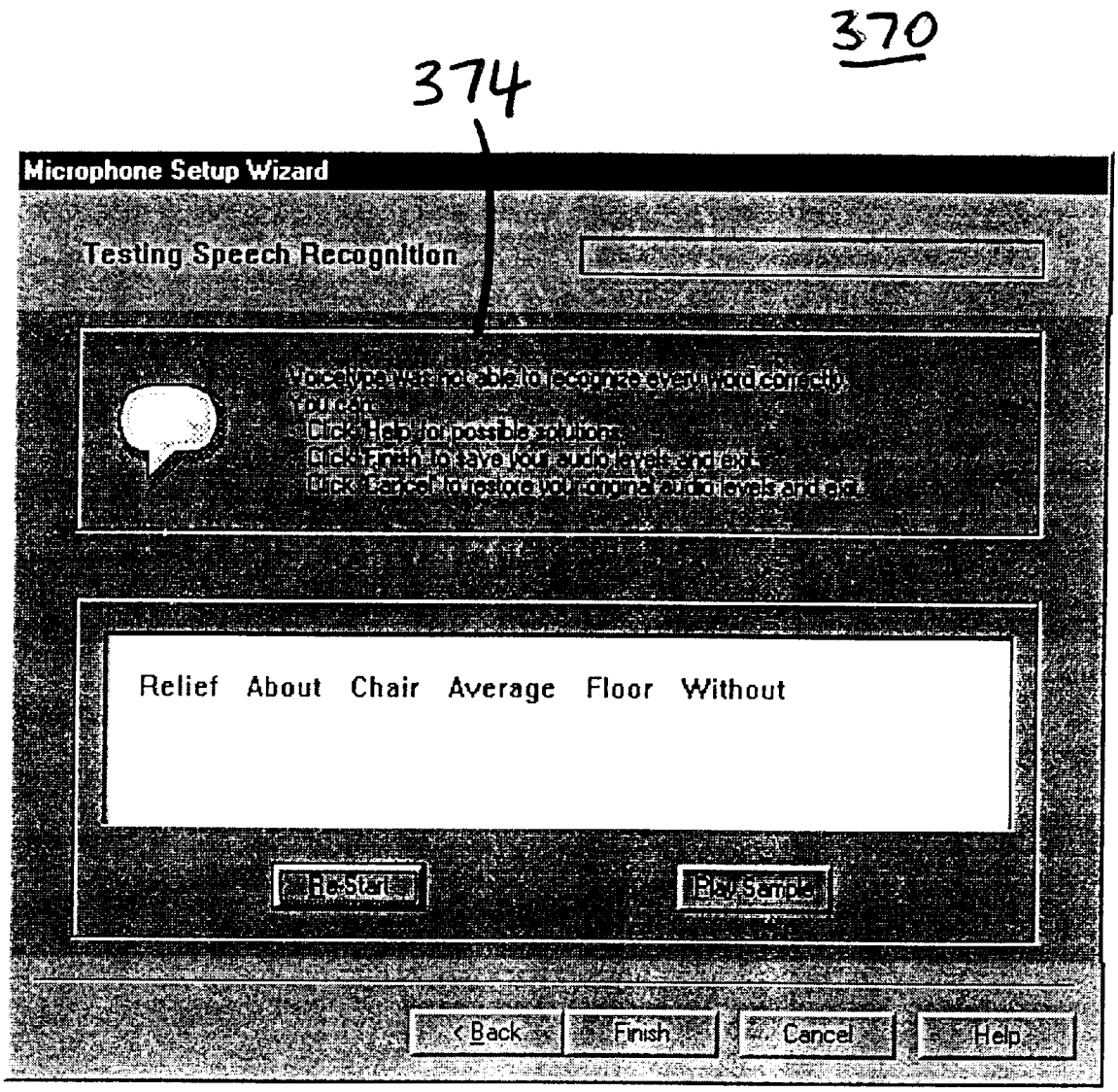

370
374
Microphone Setup Wizard
Testing Speech Recognition
Relief About Chair Average Floor Without
Re-Start
Play Sample
< Back
Finish
Cancel
Help

FIG. 37

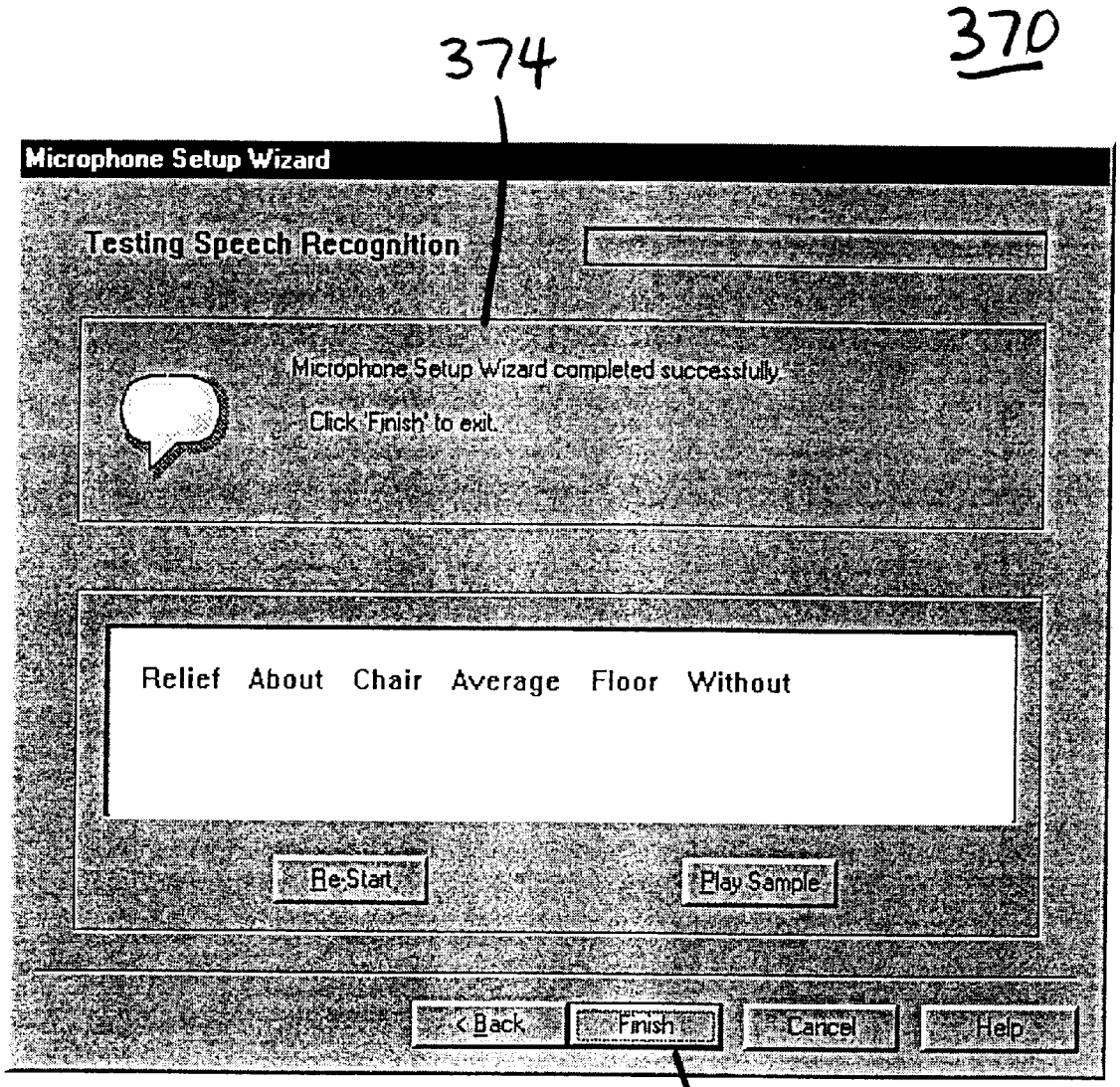

374
370
Microphone Setup Wizard
Testing Speech Recognition
Microphone Setup Wizard completed successfully.
Click 'Finish' to exit.
Relief About Chair Average Floor Without
Re-Start
Play Sample
< Back
Finish
Cancel
Help
382

FIG. 38

380

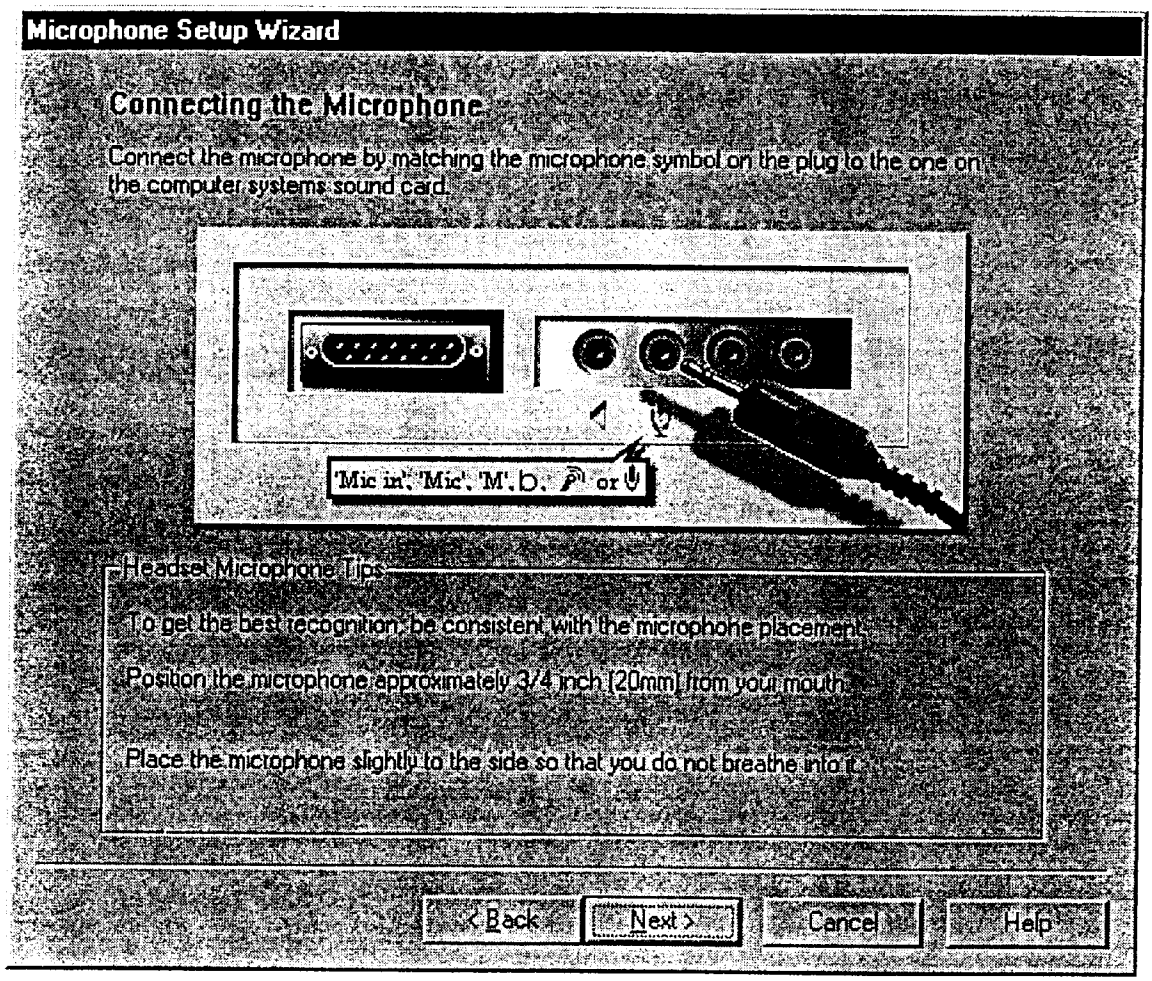

Microphone Setup Wizard
Connecting the Microphone
Connect the microphone by matching the microphone symbol on the plug to the one on the computer systems sound card.
'Mic in', 'Mic', 'M', or
Headset Microphone Tips
To get the best recognition, be consistent with the microphone placement.
Position the microphone approximately 3/4 inch [20mm] from your mouth.
Place the microphone slightly to the side so that you do not breathe into it.
< Back
Next >
Cancel
Help

FIG. 39

390

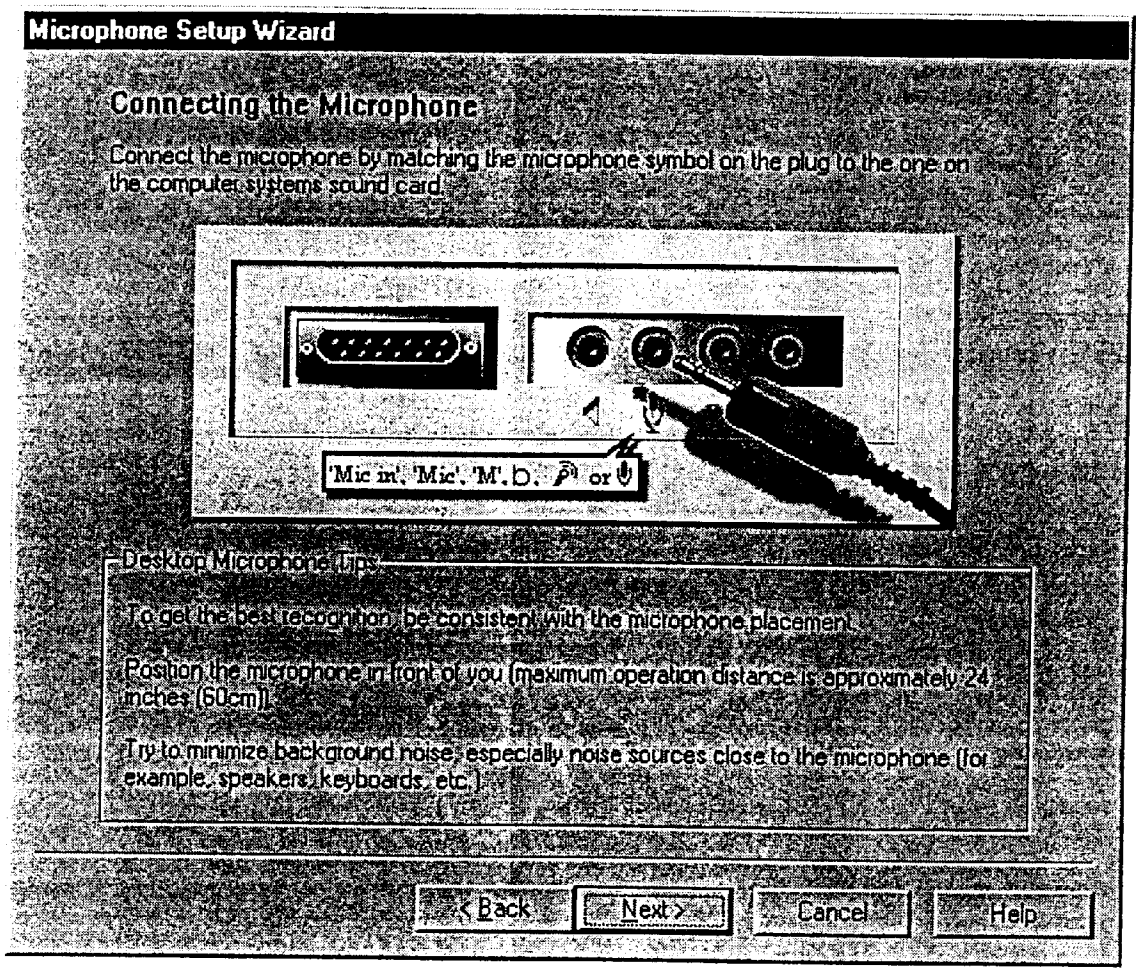

Microphone Setup Wizard
Connecting the Microphone
Connect the microphone by matching the microphone symbol on the plug to the one on the computer systems sound card.
'Mic in', 'Mic', 'M', or
Desktop Microphone Tips:
To get the best recognition, be consistent with the microphone placement.
Position the microphone in front of you (maximum operation distance is approximately 24 inches (60cm)).
Try to minimize background noise, especially noise sources close to the microphone (for example, speakers, keyboards, etc.).
< Back
Next >
Cancel
Help

FIG. 40

400

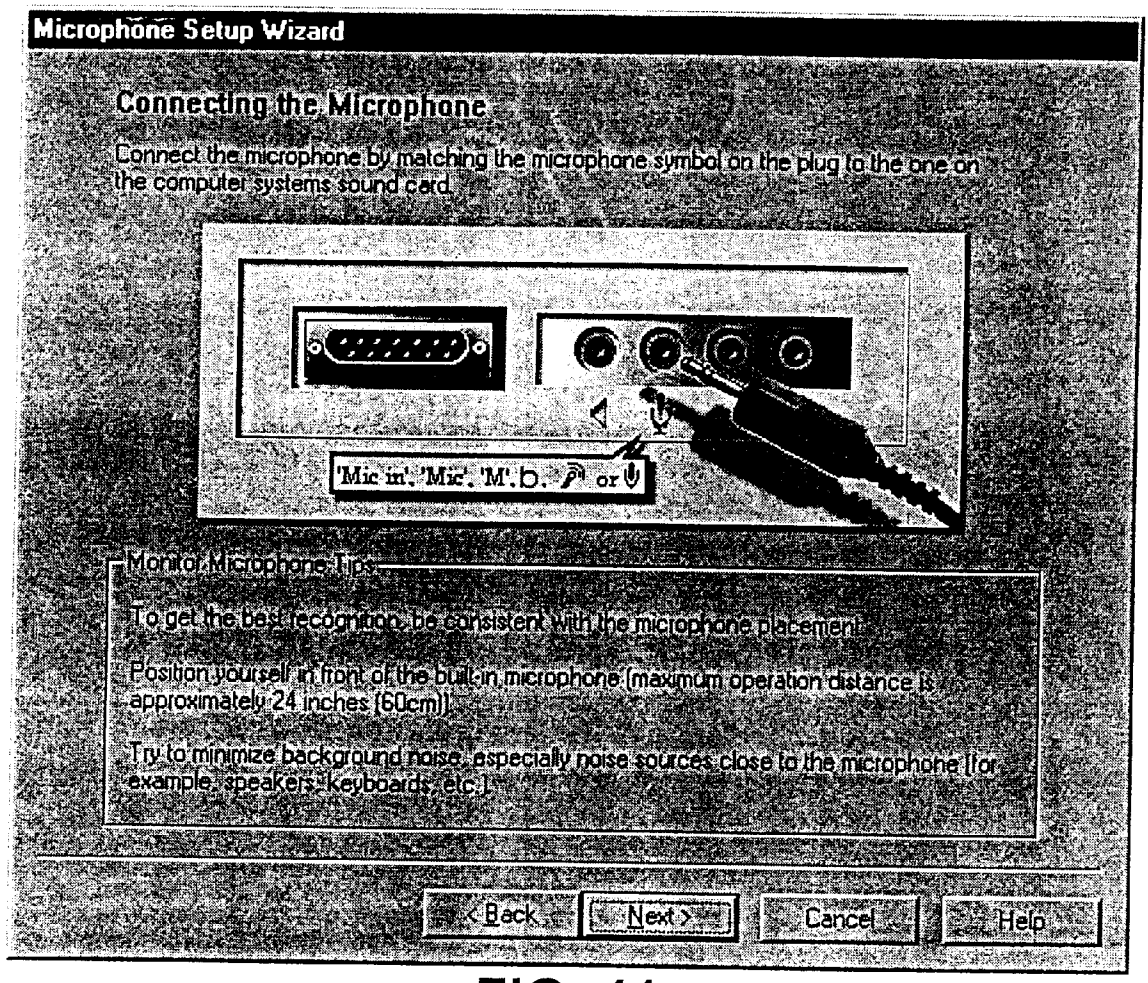

Microphone Setup Wizard
Connecting the Microphone
Connect the microphone by matching the microphone symbol on the plug to the one on the computer systems sound card.
'Mic in', 'Mic', 'M', b, or
Monitor Microphone Tips
To get the best recognition, be consistent with the microphone placement.
Position yourself in front of the built-in microphone (maximum operation distance is approximately 24 inches [60cm]).
Try to minimize background noise, especially noise sources close to the microphone (for example, speakers, keyboards, etc.).
< Back
Next >
Cancel
Help

FIG. 41

410

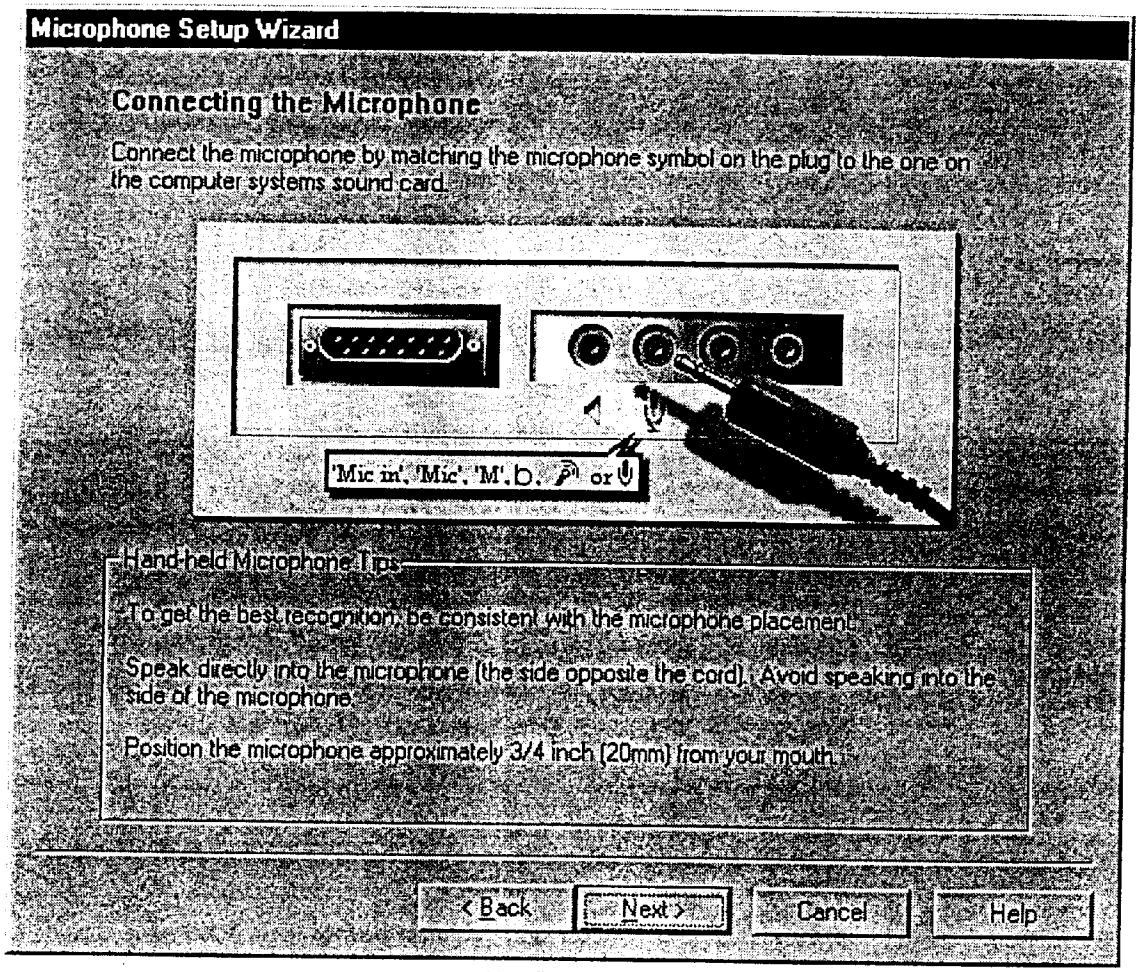

Microphone Setup Wizard
Connecting the Microphone
Connect the microphone by matching the microphone symbol on the plug to the one on the computer systems sound card.
'Mic in', 'Mic', 'M', or
Hand-held Microphone Tips:
To get the best recognition, be consistent with the microphone placement.
Speak directly into the microphone (the side opposite the cord). Avoid speaking into the side of the microphone.
Position the microphone approximately 3/4 inch (20mm) from your mouth.
< Back
Next >
Cancel
Help

FIG. 42

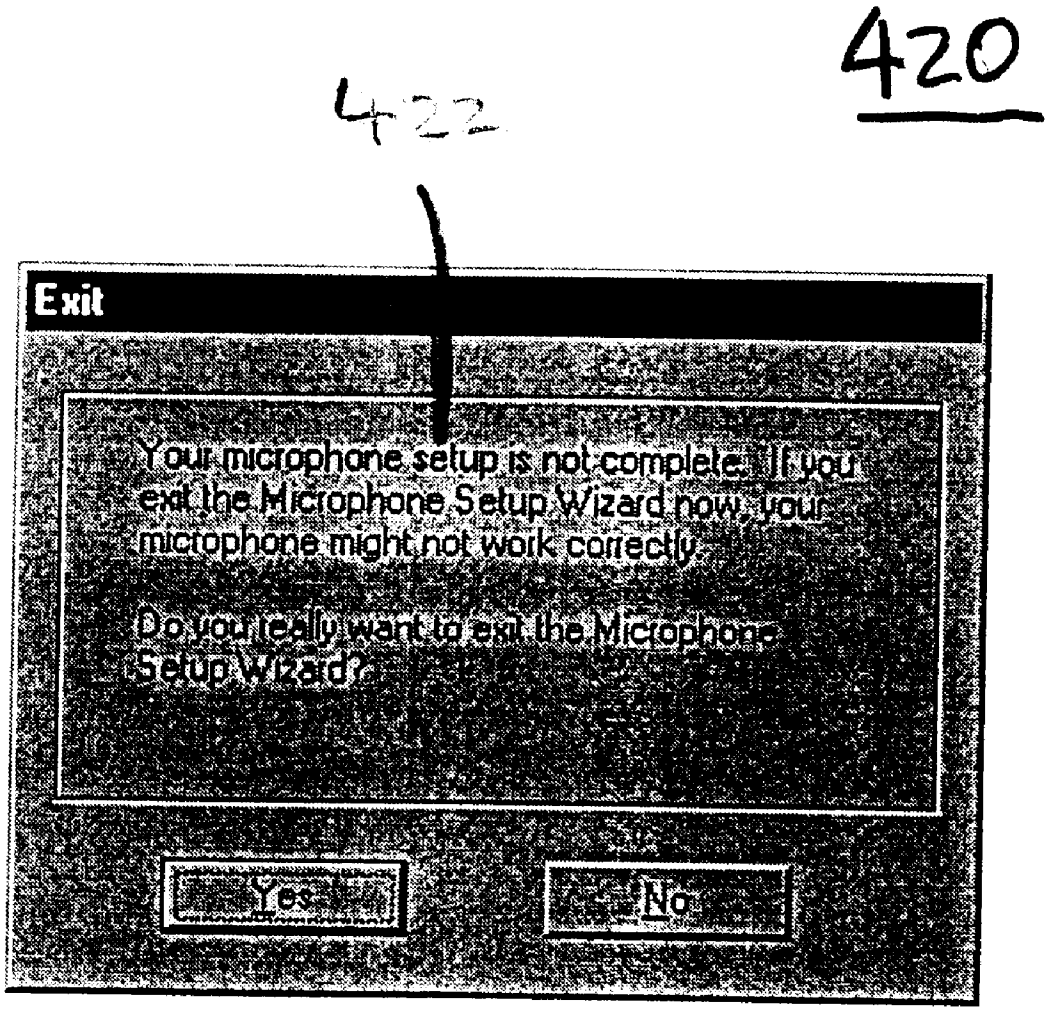

420
422
Exit
Your microphone setup is not complete. If you exit the Microphone Setup Wizard now, your mictophone might not work correctly.
Do you really want to exit the Microphone Setup Wizard?
Yes
No

FIG. 43

430

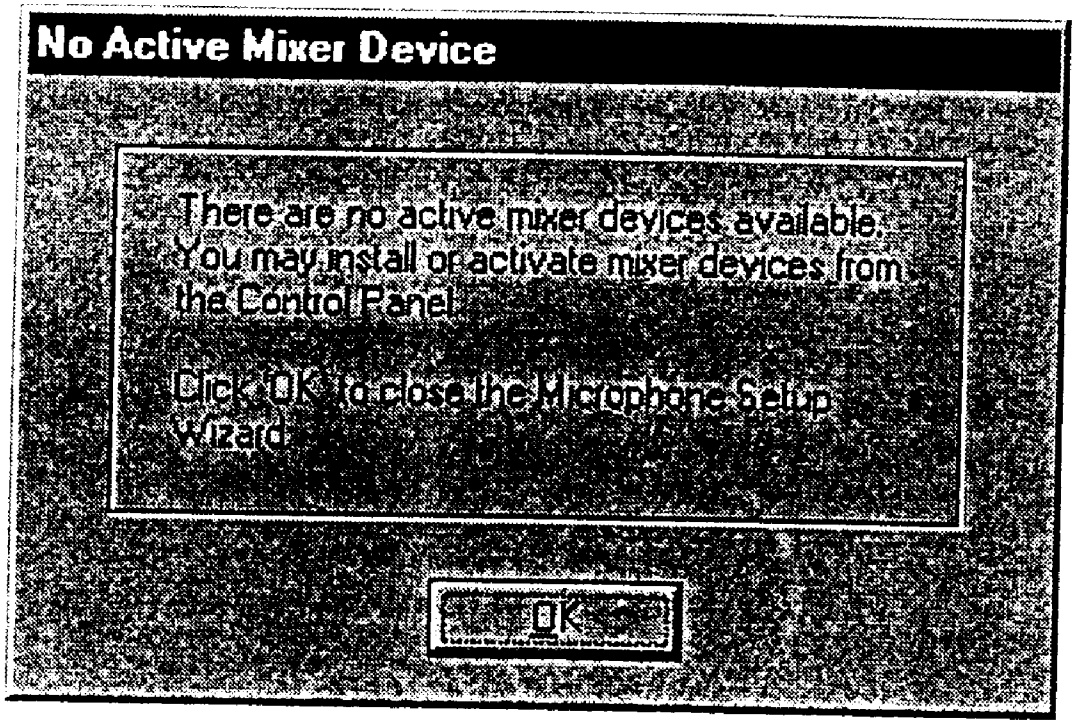

No Active Mixer Device
There are no active mixer devices available. You may install or activate mixer devices from the Control Panel.
Click OK to close the Microphone Setup Wizard.
OK

FIG. 44

440

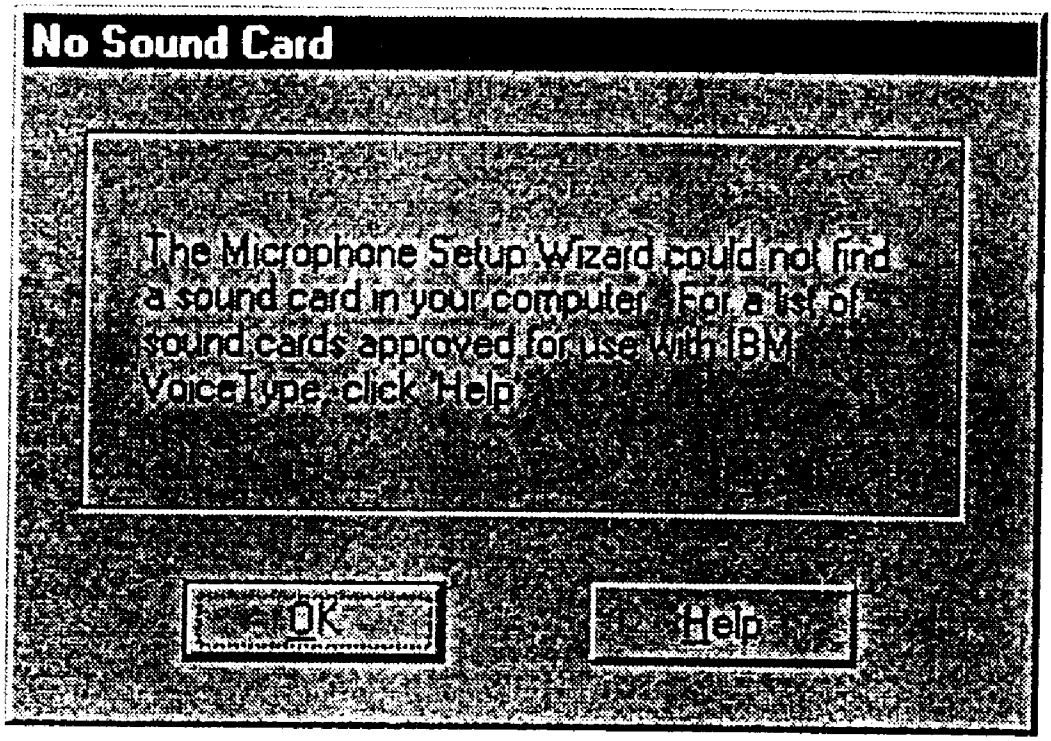

No Sound Card
The Microphone Setup Wizard could not find a sound card in your computer. For a list of sound cards approved for use with IBM VoiceType, click Help.
OK
Help

FIG. 45

450

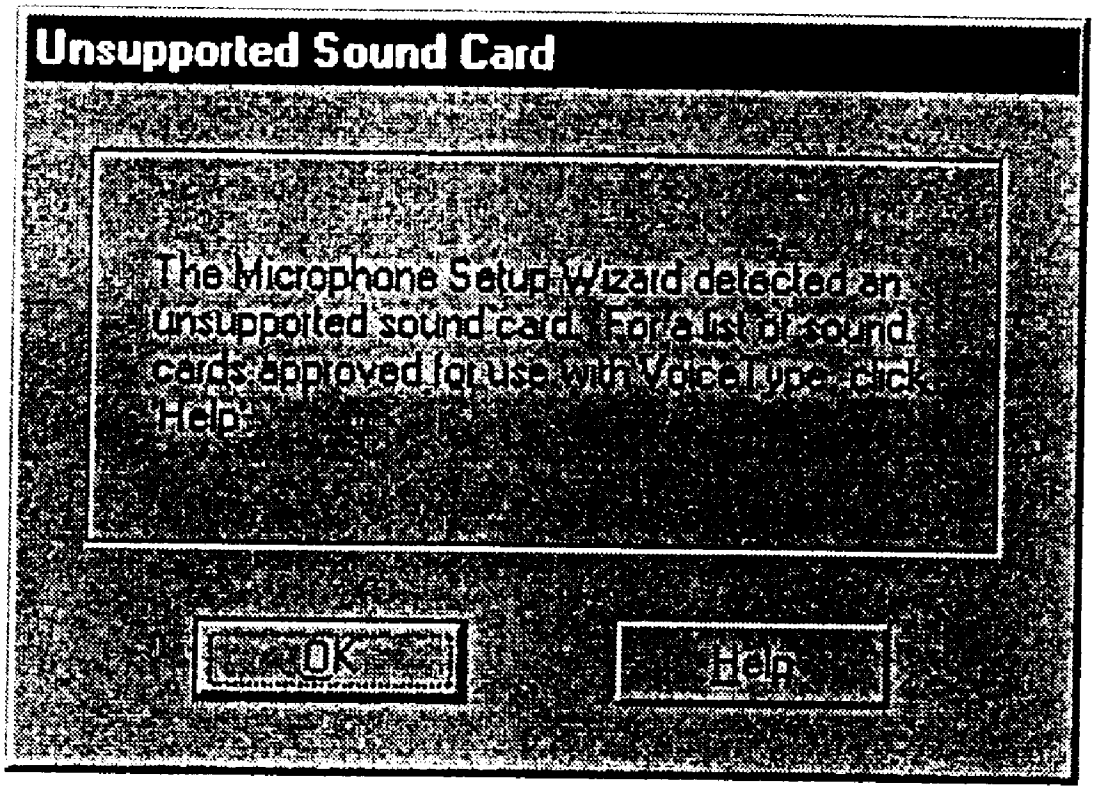

Unsupported Sound Card
The Microphone Setup Wizard detected an unsupported sound card. For a list of sound cards approved for use with VoiceType, click Help.
OK
Help

FIG. 46

460

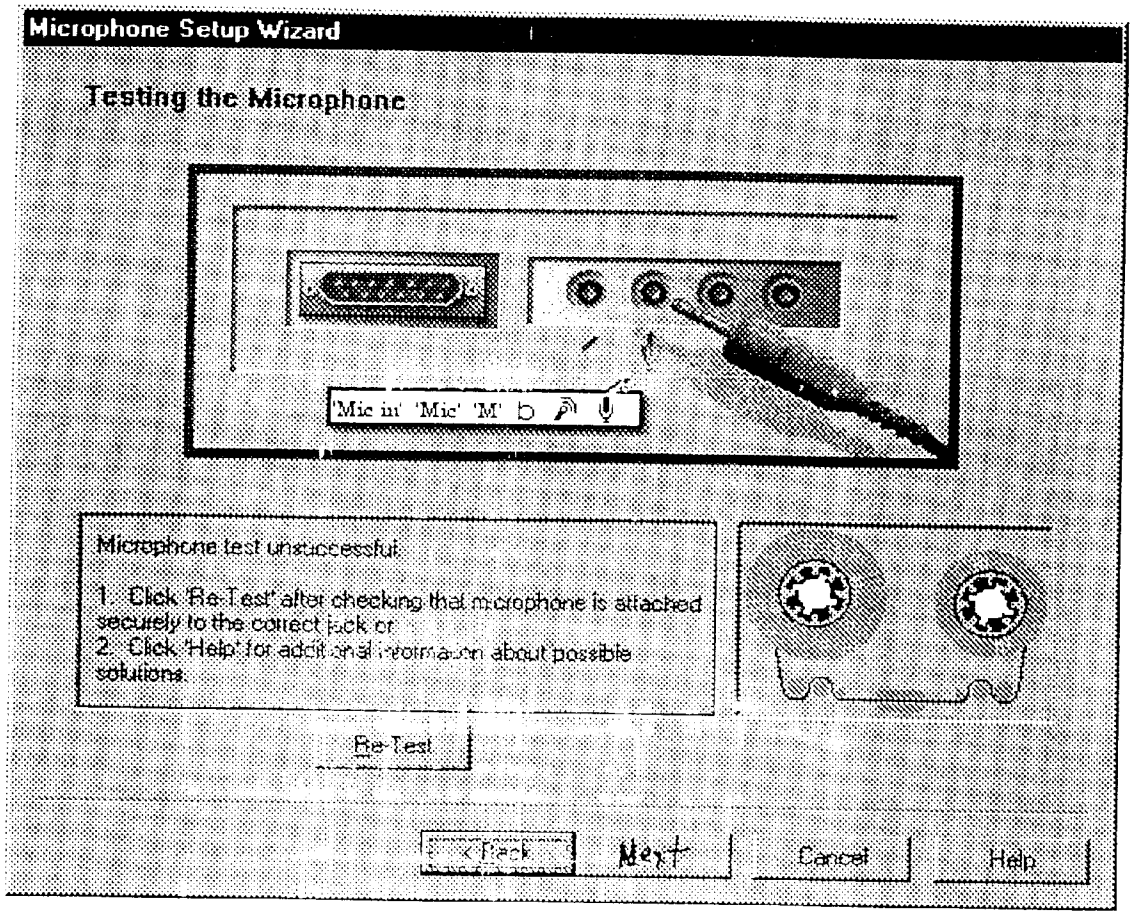

Microphone Setup Wizard
Testing the Microphone
'Mic in' 'Mic' 'M'
Microphone test unsuccessful.
1. Click 'Re-Test' after checking that microphone is attached securely to the correct jack or
2. Click 'Help' for additional information about possible solutions.
Re-Test
< Back
Next
Cancel
Help

FIG. 47

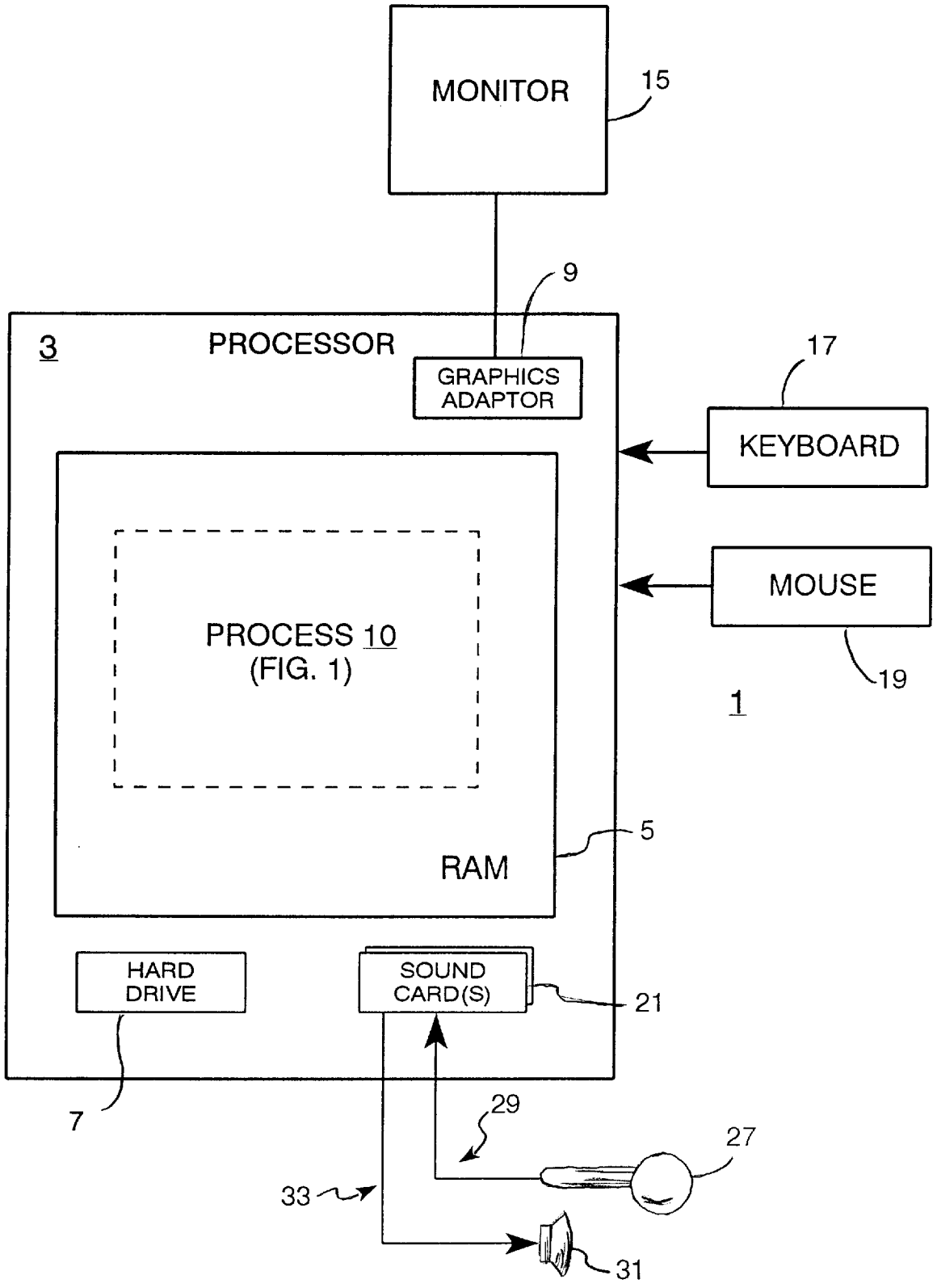

MONITOR
15
9
3
PROCESSOR
GRAPHICS ADAPTOR
17
KEYBOARD
MOUSE
19
1
PROCESS 10
(FIG. 1)
RAM
5
HARD DRIVE
SOUND CARD(S)
21
7
29
27
33
31

FIG. 48

CONFIGURING AN AUDIO INTERFACE CONTINGENT ON SOUND CARD COMPATIBILITY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the field of configuring microphones and audio systems in computer systems, and in particular, to a method and graphical user interface for configuring one or more microphones, one or more speakers, one or more sound cards and one or more audio mixers for use with a speech recognition application.

2. Description of Related Art

The use of microphones in connection with personal computers has increased in popularity due to the advent of inexpensive multimedia computers and sophisticated applications like collaboration on the Internet, telephony and speech recognition.

Proper microphone connection and audio settings are among the most important elements in achieving required performance from the audio components of a computer, especially for speech recognition. Tools that help unskilled users properly configure and adjust their microphone and audio settings are important differentiators for these types of applications.

SUMMARY OF THE INVENTION

The inventive arrangements taught herein provide numerous advantages in simplifying configuring an audio interface for a speech recognition application, particularly for connecting and adjusting one or more microphones and one or more audio output speakers. The microphone and speaker setup taught herein can be used for other applications as well. This inventive arrangements simplify and expedite setting up an audio interface in the following ways.

Step by step instructions are provided for connecting a microphone to various audio systems. The audio input is tested to determine that the microphone is properly configured, in both power and signal parameters, to provide proper audio input and output.

Program flow is adapted depending on selection of the audio output device, the microphone, the number of compatible sound cards and whether any microphone connection adapters are available.

The microphone configuration and adjustments are designed to work with and for either dynamic and electret types of microphones.

Comparing background noise levels to speech levels allows operation over a wide range of microphones and audio systems.

The audio mixer is configured for speech recognition by selecting and adjusting microphone inputs, while at the same time, deselecting inputs and outputs as specific to each configuration that would otherwise interfere with microphone operation.

Multiple audio cards are supported, allowing the user to select between one or more audio cards for input and output. Mixer adjustments are based on the audio card selection, and for each card separately.

Sound cards are tested in the system to insure that only those sound cards that meet the minimum requirements to support the speech application are listed for selection by the user.

The program flow is modified after the first time through the microphone configuration process. Subsequent runs allow the user to bypass the microphone hardware configuration tests and go directly to the audio mixer adjustments.

Graphic user interfaces and associated displays are designed to be easily configured for different combinations of microphone and manufacture-specific information.

A method for configuring an audio interface for a speech recognition application in a computer system in accordance with an inventive arrangement comprises the steps of: (a) determining how many sound cards present in the computer system are capable of supporting speech; (b) in the event at least two of the sound cards present in the computer system are speech capable, displaying a first graphical user interface for user selection of the speech capable sound cards; and, (c) in the event only one speech capable sound card is detected, and in the event one of at least two speech capable sound cards has been user selected, determining if an audio mixer is present in the computer system.

The method can further comprise the step of displaying a second graphical user interface providing user prompts for selecting between speaker types for audio output and for identifying microphone package parts.

The method can also further comprise the steps of: displaying, prior to step (b), a second graphical user interface in the event that no sound card is detected in step (a), the second graphical user interface identifying sound cards compatible with the speech recognition application; and, terminating the method.

The method can also further comprise the alternative steps of: displaying, prior to step (b), a second graphical user interface in the event that each sound card detected in step (a) is incompatible with the speech recognition application, the second graphical user interface identifying sound cards compatible with the speech recognition application; and, terminating the method.

BRIEF DESCRIPTION OF THE DRAWINGS

There are shown in the drawings forms which are presently preferred. It should be understood, however, that the inventive arrangements are not limited to the precise arrangements and instrumentalities shown.

FIG. **1** is a flow chart of a method, according to the inventive arrangements taught herein, for configuring an audio interface for a speech recognition application in a computer system.

FIG. **2** is an exemplary screen display for a graphical user interface useful for welcoming a user to a microphone setup process according to the inventive arrangements.

FIG. **3** is an exemplary screen display for a graphical user interface useful for selecting a sound card.

FIG. **4** is an exemplary screen display for a graphical user interface useful for selecting a microphone type.

FIG. **5** is an exemplary screen display for a graphical user interface useful for gathering information on microphone parts, with no parts selected.

FIG. **6** is the exemplary screen display for a graphical user interface as shown in FIG. **5**, but with all microphone parts selected.

FIG. **7** is an exemplary screen display for a graphical user interface useful for connecting the headset speaker plug to the computer system.

FIG. **8** is an exemplary screen display for a graphical user interface useful for instructing a user in positioning and adjusting the headset.

FIG. **9** is an exemplary screen display for a graphical user interface useful for testing audio playback.

FIG. **10** is an exemplary screen display for a graphical user interface useful for explaining a first set of microphone connections.

FIG. **11** is an exemplary screen display for a graphical user interface useful for explaining a second set of microphone connections.

FIG. **12** is an exemplary screen display for a graphical user interface useful for explaining a third set of microphone connections.

FIG. **13** is an exemplary screen display for a graphical user interface useful for illustrating the connection in a headset speaker configuration.

FIG. **14** is an exemplary screen display for a graphical is user interface useful for illustrating the connection in an internal speaker configuration.

FIG. **15** is an exemplary screen display for a graphical user interface useful for illustrating the connection in an external speaker configuration.

FIG. **16** is an exemplary screen display for a graphical user interface useful for initiating a user interactive microphone test.

FIG. **17** is the exemplary screen display of FIG. **16** as a room noise sample is recorded.

FIG. **18** is the exemplary screen display of FIG. **16** as a speech sample is recorded.

FIG. **19** is the exemplary screen display of FIG. **16** as indicating a successful microphone test.

FIG. **20** is an exemplary screen display for a graphical user interface useful for providing instructions when the microphone test has failed.

FIG. **21** is an exemplary screen display for a graphical user interface useful for explaining connection of a power adapter in a headset configuration.

FIG. **22** is an exemplary screen display for a graphical user interface useful for initiating a user interactive microphone test with the power adapter in an external speaker configuration.

FIG. **23** is an exemplary screen display for a graphical user interface useful for explaining connection of a battery adapter in a headset configuration.

FIG. **24** is an exemplary screen display for a graphical user interface useful for providing battery tips.

FIG. **25** is an exemplary screen display for a graphical user interface useful for indicating completion of microphone connection.

FIG. **26** is an exemplary screen display for a graphical user interface useful for initiating a user interactive audio level test.

FIG. **27** is the exemplary screen display shown in FIG. **26** during audio recording.

FIG. **28** is the exemplary screen display shown in FIG. **26** as indicating completion of audio level adjustment.

FIG. **29** is the exemplary screen display shown in FIG. **26** as indicating no detection of audio input.

FIG. **30** is an exemplary screen display for a graphical user interface useful for instructing a user to add the signal adapter, when no power adapter is present.

FIG. **31** is an exemplary screen display for a graphical user interface useful for instructing a user to add the signal adapter, when the power adapter is already present.

FIG. **32** is an exemplary screen display for a graphical user interface useful for instructing a user to remove the signal adapter, when no power adapter is present.

FIG. **33** is an exemplary screen display for a graphical user interface useful for instructing a user to remove the signal adapter, when the power adapter is present.

FIG. **34** is an exemplary screen display for a graphical user interface useful for initiating a user interactive speech recognition test.

FIG. **35** is the exemplary screen display of FIG. **34** during speech recording.

FIG. **36** is the exemplary screen display of FIG. **34** as indicating a first, second or third speech recognition failure.

FIG. **37** is the exemplary screen display of FIG. **34** as indicating a fourth speech recognition failure.

FIG. **38** is the exemplary screen display of FIG. **34** as indicating successful completion of the speech recognition test.

FIG. **39** is an exemplary screen display for a graphical user interface useful for explaining the connection and configuration of a generic headset microphone.

FIG. **40** is an exemplary screen display for a graphical user interface useful for explaining the connection and configuration of a generic desktop microphone.

FIG. **41** is an exemplary screen display for a graphical user interface useful for explaining the connection and configuration of a generic monitor microphone.

FIG. **42** is an exemplary screen display for a graphical user interface useful for explaining the connection and configuration of a generic hand-held microphone.

FIG. **43** is an exemplary screen display for a graphical user interface useful for instructing a user to exit from an incomplete microphone setup.

FIG. **44** is an exemplary screen display for a graphical user interface useful for advising a user that no active mixer device is available.

FIG. **45** is an exemplary screen display for a graphical user interface useful for advising a user that no sound card was found.

FIG. **46** is an exemplary screen display for a graphical user interface useful for advising a user an unsupported sound card was found.

FIG. **47** is an exemplary screen display for a graphical user interface useful for advising a user that testing the microphone was unsuccessful.

FIG. **48** is a block diagram of a computer system that can be programmed with a routine set of instructions for implementing the method and graphical user interfaces in accordance with the inventive arrangements.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** a flow chart of a method, according to the inventive arrangements taught herein, for configuring an audio interface for a speech recognition application, or program, in a computer system. The flow chart represents an automated sequence of controls referred to as a Wizard in one or more commercial products embodying the inventive arrangements. The commercial products are the ViaVoice, VoiceType and IBM Simply Speaking speech recognition programs, available from IBM. ViaVoice, VoiceType, IBM Simply Speaking and IBM are trademarks of International Business Machines corporation. The Wizard, which represents a tool, may be conveniently thought of as an intermediary or representative of the speech recognition application that guides a user through the configuring process in a thorough, efficient and user-friendly manner. Of course, the

Wizard is part of the speech recognition application itself. FIGS. **2–48** represent so-called screen shots from one or more of the commercial products, that is, snapshots or downloads of graphical user interface monitor screen displays associated with different steps and parts of the flow chart shown in FIG. **1**. The screen shots in the program are protected by copyright. Copyright notices are found in the applications but are omitted from the drawings herein. The inventive arrangements, therefore, must be recognized as comprising various steps of the method illustrated by the flow chart, various ones of the graphical user interface displays, various sequences of the steps and of the graphical user interface displays and various combinations thereof. The inventive arrangements also comprise computer systems programmed with a routine set of instructions stored in a physical medium for implementing the various steps, graphical user interface displays, sequences and combinations thereof.

The flow chart in FIG. **1** illustrates the reasoning behind the sequencing of the method steps and graphical user interface displays, and conveys a high level view of the configuring process for the speech recognition application. It is impractical to show all of the possible permutations and combinations that may occur, or show all of the possible error scenarios that may result in displaying various pop-up dialogs. Accordingly, it will be appreciated that the flow chart and the graphical user interface displays shown in the drawings are representative and need not be precisely as shown in order to fall within the ambit of the inventive arrangements taught herein.

Many of the graphical user interface (GUI) displays shown herein have a first set of five icons representing so-called user activatable buttons, which the user can use to navigate through the application and the associated tool. A first of these buttons is designated Back, for repeating a step. A second of these buttons is designated Next for moving on to a following step. A third of these buttons is designated Cancel, for undoing a step in process, or in some cases, exiting from the application. A fourth button is designated Help, for initiating a help tool or utility. A fifth button is designated Finish, which can be used to accept the new settings made in accordance with the inventive arrangements. Only four of the buttons are used at the same time, the Finish button replacing the Next button when the Finish button is displayed.

Other GUI displays have a second set of two buttons user activatable buttons, which are used for enabling a user to accept a certain condition, situation or status. A first of these buttons is designated OK, for accepting the certain condition, situation or status. A second of these buttons is designated Help, for initiating a help tool or utility. The functions of these buttons will not be explained again in the following descriptions of the GUI displays shown in the drawings.

With reference to FIG. **1**, the flow chart represents a multi-path process **10**. Generally, only those arrows connecting the various blocks that represent alternate decision paths are identified by reference numerals. The remaining paths are not so identified, except as noted. In broad terms, the method assures proper selection, connection and adjustment of sound cards, microphones, microphone adapters, speakers and audio mixers, all is of which represent part of an audio interface for the speech recognition application, in a manner that is optimally compatible with operation of the speech recognition application. It is that part of the speech recognition application relating to this optimization that is embodied in the inventive arrangements taught herein. Speech recognition, in and of itself, is beyond the scope of this disclosure.

The second block **12** is the first step perceived by a user and represents the step of displaying a graphical user interface for welcoming the user to the speech recognition application, hereinafter referred to as the application. The GUI display **80** representing a Welcome page, shown in FIG. **2**, presents some general information and informs the user of the purpose of the Wizard tool. The GUI display **80** includes a message section **82** explaining the microphone set up and at least two user activatable icons, for example so-called radio buttons **84** and **86**. The message prompts the user to select one of two options by activating one of the icons. The options include setting up the microphone to be used for speech recognition and adjusting the audio level of the words to be recorded and processed by the application.

At the same time, the tool will be gathering information by querying the audio device driver for the sound card capabilities, setting up audio mixer controls and identifying all sound cards in the computer system and determining which of those sound cards, if any, is compatible with the application. Prior to the welcome step, or during part of the time the welcoming step is undertaken, the audio mixer is initially configured in accordance with step of block **8**. Without any interface with the user, and depending on the type of audio mixer, the tool deselects or mutes the microphone playback mixer control and all recording mixer controls other than the master and microphone controls. The tool then adjusts both the master and microphone volume controls to maximum. This is the starting point for the various tests which follow.

If more than one sound card in the computer system is determined to be speech capable, a GUI display **90** as shown in FIG. **3** is generated, corresponding to block **14**, which can replace GUI display **80** on the screen.

GUI display **90** includes a message section **92** identifying selection of a sound card for input and output as the immediate task for the user, as well as a first drop-down list **94** of those sound cards available for the input of audio signals and a second drop-down list **96** of those sound cards available for the output of audio signals. In accordance with the capabilities of the application and of the associated tool, the same or different sound cards can be selected for the input and output of audio signals. Once the sound cards have been selected, the GUI display **90** is replaced by the Welcome page of GUI display **80**. It will be appreciated that the sound card selecting step **14** can precede the welcome step **12**, and that GUI display **90** can be formulated as an initial screen.

In the event only one suitable sound card is determined to be present, it must be used for both the input and the output audio signals, and accordingly, no user interaction is required and no provision is made for user interaction. In fact, the user need not even be aware that selecting between multiple cards is an issue, so that avoiding even raising the issue if unnecessary is an operational advantage of the inventive arrangements. In this circumstance, sound card selecting step **14** is omitted.

Returning to GUI display **80**, irrespective of the sound card selecting step, a user unsophisticated in computer systems and speech recognition applications cannot reasonably be assumed to be aware that setting up the microphone is a prerequisite to adjusting the audio level. In accordance with another operational advantage of the inventive arrangements, the tool determines from a data storage registry of the application whether a microphone operatively

associated with the application has been previously successfully set up. If not, the audio level button **86** is deactivated and, for example, grayed in appearance as is common for unavailable options. This leaves the user with no choice other than activating button **84** to initiate setting up the microphone. If the registry indicates that a microphone has previously been successfully set up, then the user can activate either of the buttons **84** and **86** to initiate either one of the microphone set up or the audio level adjustment. A user might choose to the microphone set up a second time if a new microphone has been installed or if previous operation was deemed to be unsatisfactory.

The actual updating of registry entries in the application occurs at two points in the process. The first point is after the microphone connection has been successfully tested, in block **46**, so that the user can exit from the application, if desired, without having to connect and test the microphone again when the application is next used. The second point is after the microphone setup has successfully concluded, in block **52**.

After the welcome step **12**, and the sound card selecting step **14**, if necessary, the type of microphone must be determined in step **16**. A GUI display **100** provides a drop-down list **102** of possible microphones, one of which must be selected by the user. If the microphone is one which has been manufactured specifically for use with, and packaged with the application, referred to herein as a VoiceType microphone, the method proceeds on path **18** to the gathering information step **22**. A VoiceType microphone is part of a headset assembly, illustrated for example in FIG. **4** and many other Figures, which also includes an ear piece. The cable associated with the headset includes separate plugs for the microphone and for the ear piece. The cables must be attached separately and may require different procedures and adapters. The microphone and the ear piece will also require separate tests and adjustments. If the microphone is not a VoiceType microphone, the flow chart branches on path **20** to blocks **54** and **56** in succession. This path will be described later.

The gathering information step is implemented by a GUI display **110**, shown in FIGS. **5** and **6**. The tool will display the gathering information display **110** when the user clicks Next if the user has selected VoiceType microphone in step **16**. This display is be used to gather any additional information that the user can provide. This information aids in determining which branches of the flow chart **10** will be followed. FIG. **5** shows a screen shot without any adapters selected and FIG. **6** shows a screen shot with all of the adapters selected.

The static text field **114** in the Mixer Device group box **112** identifies the audio mixer device that the tool will be using. The name returned from the mixer device driver is displayed in this field. A set **116** of three radio buttons **118**, **120** and **122** is used to customize any microphone setup diagrams that may be displayed in later screens. Buttons **118**, **120** and **122** also have an impact on the order and content of additional screens that can be added. Button **118** is for selecting external speakers. Button **120** is for selecting an internal speaker or speakers. Button **122** is for selecting a microphone headset, which includes at least one ear piece. A user selecting internal or external speakers can use the tool to test the audio playback, as explained later. A user selecting external or internal speakers can still choose to use a microphone that is part of a headset, without reliance on the ear piece associated with the headset. These represent some of the combinations and permutations that are too numerous to explain and illustrate in detail, but will be understood by those skilled in the art.

A third section **124** includes buttons with symbols representing different parts, at least some of which are packaged with each application. These include a headset button **126**, a signal adapter button **128**, a power adapter button **130** and a battery adapter button **132**. The signal adapter is a signal strength attenuator having, for example, a ratio of 4:1. Some microphones require power at their tips and others require power at their ring. Some sound cards provide power to the ring of a microphone connected thereto and others provide power to the tip. Some VoiceType microphones require power to the tip. Sound cards of the Sound Blaster type supply power to the ring. Sound Blaster is a trademark of Creative Technology, Ltd. For use with such cards, the power adapter changes the power from the ring to the tip. Some sound cards do not supply power at all for microphones or do not supply enough power for microphones. The battery adapter can supply such power when such sound cards are used.

The graphic push buttons are therefore used to help identify what adapters may have been shipped with the VoiceType microphone. This is an elegant solution to the problem of the tool not knowing what kind of microphone headset was shipped with the user's particular version of the application. Future versions of the application might ship with a customized microphone that works with a particular sound card, requiring no adapters or a microphone similar to the one that shipped with a microphone shipped with three different adapters. This can influence the flow of successive steps, as explained in the following example.

The user is prompted to unpack the headset and all of the parts packaged therewith and to select each button corresponding to a supplied part. If the tool determines, for example, that the computer is equipped with a Sound Blaster type sound card and the user indicates that all the displayed extra components are available, as shown in FIG. **6**, or indicates that at least the power adapter is available, then a subsequent Test With Power Adapter step in block **40** is advantageously implemented before a Test Without An Adapter step in block **38** and before a Test With Battery Adapter step in block **42**, because most Sound Blaster type sound cards are known to require the power adapter, and the tool is programmed with this information.

If the user selected either internal or external speakers, the method branches on path **26** to a testing audio playback step and an adjusting the headset step in blocks **34** and **36** successively. These steps will be explained in detail later.

If the user selected the headset as the sound output device, the method branches on path **24** to a connect the headset speaker step in block **28**. A GUI display **140** shown in FIG. **7** provides a picture **142** and text **144** embodying instructions for correctly plugging in the headset to the computer system. The plug for the microphone, which is brightly colored in other displays, for example green, is grayed to reduce confusion and emphasize the black speaker plug.

It cannot be assumed that all users are familiar with wearing headsets. Accordingly, the step in block **30** generates a GUI display **150**, shown in FIG. **8**, which provides a picture **152** and text **154** embodying instructions for properly wearing and mechanically adjusting the headset. The picture **152** shows headset placement and mouth positioning. On-line Help is available by pressing the Help button if the user needs additional instruction. Alternatively, an animation sequence can be provided, demonstrating the whole procedure.

After the headset has been adjusted, audio playback can be tested in the step of block **32**. A GUI display **160** shown

in FIG. **9** includes a user operable volume control **162**, an animation sequence **164** and a user activatable button **166**. GUI display **160** allows the user to set the audio output volume level to a comfortable level. Once the Test button **166** is pressed, audio will start playing. The button text will change to Stop, and the animation sequence **164** will begin. The animation sequence is provided to give a visual indication that something is going on, in the event the user may not be able to hear the audio being played, which can happen for a variety of reasons. If the user hits the Stop button or the audio plays to completion, the dialog text will be updated, the Stop text will change to Re-Test and the animation sequence will stop. If the user heard the audio test, and is satisfied with the volume level, the user is instructed to press the Next button. Otherwise the user is instructed to press the Help button for additional information.

Unseen to the user, the tool adjusts the master volume to maximum, makes sure that the waveout is not muted and sets the waveout volume to either the value in a Play Level registry entry of the application or the current waveout mixer volume control, if the registry entry is corrupted. If applicable, the microphone mixer controls are muted for playback. The master mixer control and the wave out mixer control are not muted, or are selected, depending on the type of audio mixer.

The branch beginning with path **24** terminates at the connect and test microphone step of block **38**, as does the branch beginning with path **26**. The testing audio playback step in block **34** is identical to the testing audio playback step in block **32**, except that is the internal or external speakers that are being tested, and accordingly, the headset speaker is of no concern, with regard to placement of the operation of the ear piece, which is not connected. Icons or pictures representative of the headset need not be a part of any GUI display associated with the step of block **34**. No GUI display for this step in block **34** is necessary. However, since a VoiceType microphone was selected to reach path **18**, the tool expects the microphone part of the headset to be utilized, even if the ear piece is not utilized. Accordingly, the headset is adjusted in the following step of block **36**, so that the microphone of the headset will be properly positioned for connecting and testing the microphone in following block **38**. In block **38** the branches of the flow chart that diverged from the gathering information step of block **22** join back together.

The testing audio playback step of block **54** is associated with use of a microphone that is not a VoiceType microphone. However, this microphone selection is independent of the choice of a headset or internal/external speakers in the step of block **22**. Accordingly, the testing audio playback step of block **54** is the same as the steps in blocks **32** or **34**, depending on the user selection of an audio output device.

Inasmuch as the tool has no access to information regarding the nature of the microphone tested for audio playback in the step of block **54**, the next step thereafter is to connect and test the microphone in the step of block **56**. Connecting and testing the microphone will be explained in connection with the identical step of block **38**.

In the connecting and testing microphone steps, blocks **38**, **40** and **42** represent three connection sequences, namely: the microphone alone; the microphone with a power adapter; and, the microphone with a battery adapter. For each of these connection sequences, the user is presented with a pair of screens to help the user test that sequence. The first screen of each pair describes to the user how to connect the microphone with or without the adapter appropriate for the test. The second screen leads the user through the phases of the test. Within each sequence of each of the blocks **38**, **40** and **42** the user tests various microphone configurations through the series of paired test screens. The configurations correspond to the selected audio output device, and include the headset configuration, the external speaker configuration and the internal speaker configuration. In the flow chart, the order of connection sequences is first the microphone alone, secondly the microphone with a power adapter and thirdly the microphone with a battery adapter.

The order of these steps in the flow chart has been found to be the most efficient sequence under most circumstances. However, it must be remembered that the tool is capable of changing this sequence under certain circumstances. For example, and as explained in more detail above, if the tool determines that the computer is equipped with a Sound Blaster type sound card and the user indicates that a power adapter is available, then the test with power adapter step in block **40** is advantageously implemented as the first of the three connection sequences because most Sound Blaster type sound cards are known to require the power adapter. Generating GUI displays for connecting unneeded components is also advantageously avoided. Successful completion of the connection and testing in block **40** under these circumstances makes it unnecessary for the steps of blocks **38** and **42** to be implemented.

In the steps of block **38**, the microphone must be connected before the microphone connection can be tested. The user is reminded of connection options prior to connecting the microphone. If the user has identified a power adapter, but not a battery adapter, in the information gathering step, a GUI display **170** shown in FIG. **10** will be generated. If the user has identified a battery adapter, but not a power adapter, in the information gathering step, a GUI display **172** shown in FIG. **11** will be generated. If the user has identified both a power adapter and a battery adapter in the information gathering step, a GUI display **174** shown in FIG. **12** will be generated.

The next GUI display will also depend upon prior user selections. If the user has identified and tested the headset as the audio output device, GUI display **190** shown in FIG. **13** is generated to illustrate connection of the headset microphone. Both headset plugs are shown for connection. A detailed picture **192**, in color, and clear instructions **194** simplify the task. If the user has identified and tested the internal speaker as the audio output device, GUI display **200** shown in FIG. **14** is generated to illustrate connection of the headset microphone. Only the headset microphone plug is shown for connection. No external speaker plug is shown. Detailed picture **202**, in color, and clear instructions **204** simplify the task. If the user has identified and tested external speakers as the audio output device, GUI display **210** shown in FIG. **15** is generated to illustrate connection of the headset microphone. Connection of the headset microphone plug is shown, with an external speaker plug **216** already in place. Detailed picture **212**, in color, and clear instructions **214** simplify the task.

A GUI display **220** shown in FIG. **16** is used to guide the user through the testing procedure. The microphone test has two parts and the GUI display **220** is modified as the test proceeds. The first part of the test is recording only background, room noise levels. This is explained in a message section **222**. Visual feedback is provided via an animated icon of a volume meter **224** and an icon of a tape recorder **226**, which can be shown as not operating or can be animated to illustrate recording in progress. At present, implementation of the volume meter is dependent on

whether the particular sound card/driver supports the peak meter mixer interface of the Windows 95 platform. Windows 95 is a trademark of Microsoft corporation. An instruction section **228** provides user directions. Finally, a user activatable Test button **230** is displayed to initiate the test.

When the Test button has been activated, the bottom portion of the GUI display is modified as shown in FIG. **17**. The user is instructed to remain silent in section **228**. The tape recorder undergoes an animation sequence illustrating the recording in progress. The volume meter moves as appropriate. After recording the room noise level, the recording is terminated and the corresponding animation of the tape recorder and the volume meter is terminated.

In the next step, the GUI display **220** is modified as shown in FIG. **18**. The user is instructed to recite a phrase into the microphone, for example "I am testing my microphone setup." The text of the button **230** is changed to Continue. Recording the phrase is initiated by pressing the Continue button. The animation sequences of the tape recorder and the volume meter begin again as the phrase is recited into the microphone. After a predetermined amount of recording time, for example about five seconds, the recording is terminated, as are the corresponding animation sequences of the tape recorder and volume meter.

The tool then compares the signal level and noise level and determines whether or not there was a valid microphone signal. If the test was successful, the text in section **228** is modified to advise the user that the microphone test was successful and that the configuration process can continue when the user activates the Next button, as shown in FIG. **19**. In the event the user chooses to retest the connection, the text of the button **230** is change to Re-Test. Activation of the Re-Test button would return the user to GUI display **220** as shown in FIG. **16**.

If the microphone test is successful, the flow chart branches on path **60** to the step of block **46**, which will be later explained in detail. If the microphone test is not successful, GUI display **240** as shown in FIG. **20**. GUI display **240** includes a picture **242** of the headset and microphone plug as tested, to remind the user of the proper connection. This picture will differ, depending upon the user's prior selection of an output audio device. GUI display **240** also includes the tape recorder representation **246** and a volume bar representation **244** as shown GUI display **220** in FIG. **16**. In the instruction section **248**, the user is provided with two options. One option is check the microphone plug for secure attachment and to retest the microphone connection. The other option is to select the Next button to initiate a determination if the sound card requires an adapter.

If the retesting is successful, the process branches to the step of block **46** on path **60**. If the retesting is unsuccessful, and no power adapter or battery adapter was identified in the information gathering step, the process branches on path **64** to block **58**, corresponding to a failure of the microphone connection with no adapter alternatives available.

If the retesting is unsuccessful or the user chooses not to retest, and a power adapter is available, the process moves to the step of connecting a power adapter and retesting the connection. If the retesting is unsuccessful or the user chooses not to retest, and no power adapter is available, but a battery adapter is available, the process advantageously skips the step of block **40** and moves to the step of connecting a battery adapter and retesting the connection in block **42**.

Assuming that testing the microphone alone was unsuccessful, and that a power adapter was identified, a GUI display **260** shown in FIG. **21** instructs the user on connecting the power adapter. A detailed picture **262** includes the power adapter **264**. An instruction section **266** explains the connection. Activating the Next button returns the user to a GUI display identical to GUI display **220** shown in FIG. **16**, except that the screen is titled Testing With Power Adapter. It will be appreciated that picture **262** will correspond to the audio output device selected by the user, as is the case with many of the alternative screen displays explained above. It is unnecessary to illustrate these alternative screens. The retesting proceeds as explained in connection with block **40**. If the retesting with the power adapter is successful, the process branches on path **62** to block **46**. If the retesting is unsuccessful, GUI display **270** as shown in FIG. **22** is generated. GUI display **270** has a picture **272** showing the arrangement being tested, namely with a power adapter. The picture **272** will differ in accordance with the selected audio output device. The steps associated with GUI display **270** are the same as those explained in connection with GUI display **240**. If the retesting is unsuccessful and no battery adapter is available, the process branches on path **66** to block **58**. If the retesting is unsuccessful and a battery adapter is available, the process moves to the connecting and testing with a battery adapter step of block **42**.

In block **42**, a GUI display **280** shown in FIG. **23** instructs the user on connecting the battery adapter. A detailed picture **282** includes the battery adapter **284**. An instruction section **286** explains the connection. Even the polarity of the batteries is illustrated. Activating the Next button returns the user to a GUI display identical to GUI display **220** shown in FIG. **16**, except that the screen title changes to Testing With Battery Adapter. It will be appreciated that picture **262** will correspond to the audio output device selected by the user, as is the case with many of the alternative screen displays explained above. It is unnecessary to illustrate these alternative screens. The retesting proceeds as explained in connection with block **40**. If the retesting is unsuccessful, the process branches on path **68** to block **58**. If the retesting with the battery adapter is successful, the process moves to the step of battery tips block **44**.

A GUI display **290** shown in FIG. **24** is displayed only if a battery adapter was identified and the test with a battery adapter was successful. GUI display **290** instructs the user in proper use of the battery adapter, including expected battery life and preferred battery types. When the user clicks Next, the process moves to microphone connection complete step of block **46**, which can also be a step directly following blocks **38**, **40** and **56**. A GUI display **300** shown in FIG. **25** advises the user that the microphone connection is complete. GUI display **300** is the final page of the microphone connection and testing, and can be used to display any additional or closing information **302** to the user that might be of value. At this point the user should be able to hear audio playback, know how to position the microphone and have the correct microphone setup that allows the user to record audio using the VoiceType supplied microphone. Certain registry entries concerning the microphone setup are updated, in the event the user chooses to exit from the program. The user is instructed to activate the Next button to move to the adjusting audio level step of block **48**.

Adjusting the audio recording level is guided by GUI display **310** shown in FIG. **26**. GUI display **310** includes an animated volume bar **312**, an instruction section **314**, a sample word section **320**, a Start button **322** and a Play Sample button **324**. Instruction section **314** includes icons of a microphone **316** and a volume control **318**. The user is instructed to click the Start button. In response to the start

button, GUI display **310** is modified as shown in FIG. **27**. The user is instructed to say the six words listed in section **320** as they are highlighted by a colored pacer box, for example blue, or box outline as shown. The volume bar **312** is animated during the dictation to provide feedback to the user. The volume bar **312** is preferably one color to discourage users from adjusting their voices if they notice that their voices are out of range. The user can see a demonstration of this process by clicking the Play Sample button. If the test is successful, GUI display **310** is modified as shown in FIG. **28**. The user is advised that the audio adjustment is complete and is instructed to click the Next button to continue the process.

If no audio is detected after 5 seconds, GUI display **310** will be modified as shown in FIG. **29**. The instruction section **314** instructs the user to seek Help or to restart the test. If audio is detected, but the tool is unable to properly adjust the audio, the user will be prompted to add or remove the signal adapter if the tool cannot adjust the volume to an acceptable level by adjusting the mixer volume level. The user will be instructed to add the signal adapter if the following conditions are true: the user selected a signal adapter on the gathering information step; and, the tool has lowered the mixer volume slider to the bottom 5% of the maximum range. The user will be instructed to remove the signal adapter if the following conditions are true: the registry in the application indicates that the user is currently using the signal adapter; and, the tool has raised the mixer volume slider to 100% of the maximum range.

GUI display **330** shown in FIG. **30** will be displayed if no power adapter is being used. GUI display **330** provides pictorial and text instructions for adding a signal adapter **332** when no power adapter is present. Alternatively, the picture can be animated. GUI display **340** shown in FIG. **31** will be displayed if a power adapter is being used. GUI display **340** provides pictorial and text instructions for adding a signal adapter **342** when a power adapter **344** is present. Alternatively, the picture can be animated. Two displays are necessary for adding the signal adapter because the signal adapter must be added at a specific location if the power adapter is being used. In particular, the signal adapter must be connected between the microphone plug and the power adapter. A similar GUI display, not shown, can be provided for adding the signal adapter when the battery adapter is used.

GUI display **350** shown in FIG. **32** will be displayed if no power adapter is being used. GUI display **350** provides pictorial and text instructions for removing a signal adapter **352** when no power adapter is present. Alternatively, the picture can be animated. GUI display **360** shown in FIG. **33** will be displayed if a power adapter **364** is being used. GUI display **360** provides pictorial and text instructions for removing a signal adapter **362** when no power adapter is present. Alternatively, the picture can be animated.

If the tool is unable to properly adjust the audio level, the process branches to a block, not shown, which results in generation of an advisory message that the adjusting audio level step is incomplete. The user is instructed on various options, including readjustment of the sound card parameters independently of the application and the tool.

If the audio level adjustment test is successful and the user clicks the Next button, the process moves to the test speech recognition step of block **50**. GUI display **370** shown in FIG. **34** is generated to test speech recognition, and includes a volume bar **372**, an instruction section **374** and a sample word section **376**. The Start button **378** and the Play Sample button **380** have the same purpose as explained in connection with GUI display **310** in FIG. **26**. A new button **382** designated Finish replaces the Next button at the bottom of the display.

The user is provided with two options. One option is to save the adjusted audio levels and exit the application by clicking the finish button. Saving the adjusted audio levels is necessary because none of the adjusted settings is otherwise saved until the microphone setup has successfully concluded in an expected manner. The other option is to click the Start button to initiate testing speech recognition.

The application must try to recognize the words that the user is speaking. If the application does not recognize a word then its color is changed, for example from black to red. The six words are selected because they are easily recognized by the application, and if the audio levels are reasonably close to optimal, the words should all be recognized. When the Start button has been clicked, the words are successively highlighted as shown in FIG. **35**, and the user performs the same speaking task as when adjusting the audio level, as explained in connection with GUI display **310** shown FIGS. **26** and **27**. The background of GUI display **370** can be made a different color than GUI display **310** to avoid confusion with the earlier test. The audio level meter is animated to change colors, for example, from solid blue to yellow/green/red to give the user feedback on how well the audio is adjusted. It is not necessary to discourage users from adjusting their voices because all equipment and audio adjustments have already been made.

If the user receives red words in the test two things will occur. The first three times it happens, the user will be prompted in the instruction section **374** to repeat the test, as shown in FIG. **36**. The fourth time the test fails, the instruction section will be modified as shown in FIG. **37**. The tool will suggest via on-line help that the user may need to go through enrollment or check the user's audio system.

When the user successfully completes this task, a message is displayed in section **374** that the test was successful, as shown in FIG. **38**, corresponding to the microphone setup successful step in block **52**. The user is prompted to click the Finish button, in order to store all of the adjustments and respective registry entries of the application and to exit from the tool. Thereafter, the user can use the application for speech recognition without further adjustment.

The branch beginning with path **20** does not include an adjusting headset step because the nature of the microphone is unknown to the tool. Since none of the adapters that might be necessary for use with the VoiceType microphone can be suggested by the tool for use with the other kind of microphone, the branch beginning with path **20** does not rejoin the rest of the flow chart until a microphone passing result leads to block **46** or until a microphone failing result leads to block **58**.

Referring back to connecting and testing the not VoiceType microphone in block **56** of the branch starting with path **20**, several GUI displays can nevertheless be generated that provide tips for connecting and using various kinds of microphones. GUI display **380** shown in FIG. **39** provides tips for connecting and using a generic headset microphone. GUI display **390** shown in FIG. **40** provides tips for connecting and using a generic desktop microphone. GUI display **400** shown in FIG. **41** provides tips for connecting and using a generic monitor microphone. GUI display **410** shown in FIG. **42** provides tips for connecting and using a generic hand held microphone. If the microphone test, which is the same as described in connection with block **38** is

successful, the process branches on path **70** to block **46**. If the microphone test is not successful, the process branches on path **72** to block **58**.

The microphone setup unsuccessful step of block **58**, referred to above, generates the GUI display **480** shown in FIG. **47**.

Throughout various stages of the process, certain conditions may be detected, which require termination of the microphone setup, other than failure of the various tests explained above. GUI displays can be provided for these situations. Some of these, but by no means an exclusive set, are also shown in the drawings.

A message **422** enables the user to exit the tool prior to the microphone setup being successfully completed, for any of the number of failures explained above. If the user clicks the Yes button, the tool exits. If the user clicks the No button, the Exit dialog is terminated and the tool returns to the setup process.

GUI display **430** shown in FIG. **44** informs the user that the computer system does not have an active mixer device associated with the currently selected audio device. The user is presented with some instructions and then prompted to click OK to exit from the tool.

GUI display **440** shown in FIG. **45** informs the user that no sound card could be found in the computer system. The user is prompted to click the Help button for an Internet URL (web page) and/or a list of compatible sound cards.

GUI display **450** shown in FIG. **46** informs the user that the tool detected only an unsupported sound card. If the user clicks OK, the tool exits. If the user clicks Help instructions are provided on where to find additional information on how to resolve the problem.

A computer system **1** is shown in block diagram form in FIG. **48**. The computer system is programmed with a set of instructions stored in a physical medium, for example a hard drive **7** and/or a random access memory (RAM) **5** of a central processor **3**, for optimizing an audio interface **29**, **33** between one or more sound or audio cards **21** in the computer apparatus and each of a microphone **27** and a speaker **31**. Microphone **27** is intended to represent, for example, a headset microphone, a desktop microphone, a monitor microphone and a hand held microphone. Speaker **31** is intended to represent, for example, one or more internal speakers, one or more external speakers, one or more monitor speakers or a headset speaker. The computer system **1** has a graphics adapter **9** that generates the GUI displays explained above and shown in FIGS. **2**–**48**. The computer system further comprises a monitor **15**, a keyboard **17** and a mouse **19**. The dashed line box shown in random access memory **5** represents the process **10** of the flow chart shown in FIG. **2**, and is intended to represent a programmed routine of instructions, in accordance with the inventive arrangements, stored in a physical medium embodied by hard drive **7** and loaded into another physical medium embodied by random access memory **5**. The programmed routine of instructions implements the steps of the configuring process as shown and described herein.

The numerous inventive arrangements disclosed herein provide numerous advantages in simplifying configuring an audio interface, particularly for a microphone connection and adjustment for use with a speech recognition application, although such a microphone setup can be used for other applications as well. This invention is unique in the following respects.

Step by step instructions are provided for connecting a microphone to various audio systems. The audio input is tested to determine that the microphone is properly configured, in both power and signal parameters, to provide proper audio input and output.

Program flow is adapted depending on selection of the audio output device.

The microphone configuration and adjustments are designed to work with and for either dynamic and electret types of microphones.

Comparing background noise levels to speech levels allows operation over a wide range of microphones and audio systems.

The audio mixer is configured for speech recognition by selecting and adjusting microphone inputs, while at the same time, deselecting inputs and outputs as specific to each configuration that would otherwise interfere with microphone operation.

Multiple audio cards are supported, allowing the user to select between one or more audio cards for input and output. Mixer adjustments are based on the audio card selection, and for each card separately.

Sound cards are tested in the system to insure that only those sound cards that meet the minimum requirements to support the speech application are listed for selection by the user.

The program flow is modified after the first time through the microphone configuration process. Subsequent runs allow the user to bypass the microphone hardware configuration tests and go directly to the mixer adjustments.

Graphic user interfaces and associated displays are designed to be easily configured for different combinations of microphone and manufacture-specific information.

What is claimed is:

1. A method for configuring an audio interface for a speech recognition application in a computer system, comprising the steps of:

(a) determining how many sound cards present in said computer system are capable of supporting speech;

(b) in the event at least two of said sound cards present in said computer system are speech capable, displaying a first graphical user interface for user selection of said speech capable sound cards; and,

(c) in the event only one speech capable sound card is detected, and in the event one of at least two speech capable sound cards has been user selected, determining if an audio mixer is present in said computer system.

2. The method of claim **1**, further comprising the step of displaying a second graphical user interface providing user prompts for selecting between speaker types for audio output and for identifying microphone package parts.

3. The method of claim **1**, further comprising the step of displaying, prior to step (b), a second graphical user interface in the event that no sound card is detected in step (a), said second graphical user interface identifying sound cards compatible with said speech recognition application.

4. The method of claim **3**, further comprising the step of terminating said method.

5. The method of claim **1**, further comprising the step of displaying, prior to step (b), a second graphical user interface in the event that each sound card detected in step (a) is incompatible with said speech recognition application, said second graphical user interface identifying sound cards compatible with said speech recognition application.

6. The method of claim **5**, further comprising the step of terminating said method.

7. A computer programmed with a routine set of instructions for configuring an audio interface for a speech recognition application stored in a physical medium, comprising:

means for determining how many sound cards present in said computer system are capable of supporting speech;

means operable in the event at least two of said sound cards present in said computer system are speech capable, displaying a first graphical user interface for user selection of said speech capable sound cards; and,

means operable in the event only one speech capable sound card is detected, and in the event one of at least two speech capable sound cards has been user selected, determining if an audio mixer is present in said computer system.

8. The computer of claim 7, further comprising means for displaying a second graphical user interface providing user prompts for selecting between speaker types for audio output and for identifying microphone package parts.

9. The computer of claim 7, further comprising means for displaying a second graphical user interface in the event that no sound card is detected, said second graphical user interface identifying sound cards compatible with said speech recognition application.

10. The computer of claim 7, further comprising means for displaying a second graphical user interface in the event that each sound card detected is incompatible with said speech recognition application, said second graphical user interface identifying sound cards compatible with said speech recognition application.

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